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Ag. Engr.

electrical contracting

PAGES 47-58

More than 1000 Electrical Contractors Vote on the eight proposed changes in the National Electrical Code. Here is the first definite countrywide expression of the attitude of the men who do the wiring in America.

See Pages 13 to 16

SEPTEMBER • 1939

UMI

G-E Pyranol Transformers

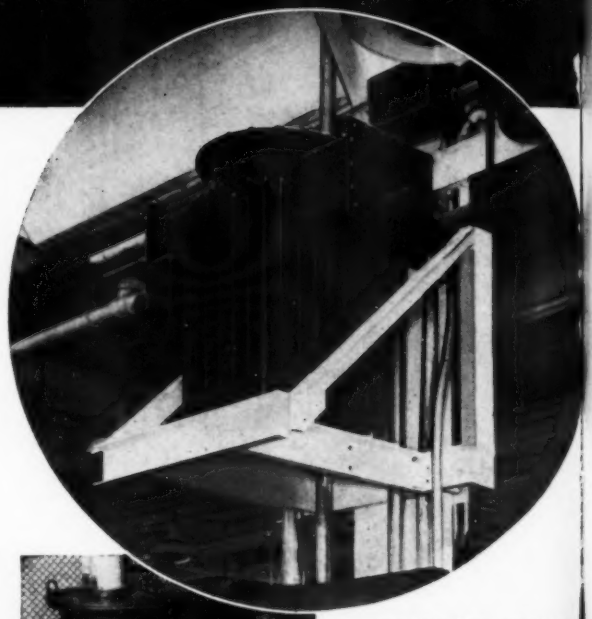
Offer NEW SOLUTIONS

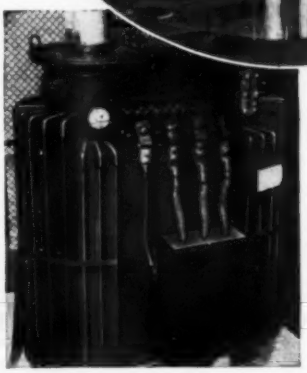
to Many Factory and Commercial Distribution Problems

PROBLEM 1
MODERNIZATION OF FACTORY LIGHTING

In one case, the engineers were asked to increase lighting levels on a factory floor to between 25 and 35 foot candles. The existing lighting circuit, which was 600 feet long, ran from a substation outside the building. To handle the increased lighting load with old methods would have required a new and larger transformer outside the building and new and larger secondary copper inside. Pyranol transformers provided a new solution to this problem that utilized the existing wiring and resulted in savings of 40 per cent.

The old wiring was split into three sections, and a small Pyranol transformer was installed at the center of each section. The expense of running new secondary copper was avoided; voltage regulation was better and power losses lower than they would have been on the long circuit.





Up near the ceiling, out of the way, is one of the Pyranol transformers that made possible savings of 40 per cent in the cost of modernizing a factory lighting circuit

PROBLEM 2
AIR CONDITIONING IN OFFICE BUILDINGS

The installation of air-conditioning equipment in buildings frequently presents a problem in power distribution that can be answered economically by Pyranol transformers. The Pyranol transformer shown at the right is installed on the third floor of the Equitable Building in Des Moines, Iowa, to supply an air-conditioning load on that floor. Because Pyranol is noninflammable, the transformer could be installed without a vault, at a convenient location near the load center.

Greater safety, plus savings in the over-all cost of transformer installations, makes Pyranol transformers the most practical and economical transformers for office buildings, theatres, hospitals, and other public buildings

PROBLEM 3
POWER FOR CONCENTRATED FACTORY LOAD

Welding machines in the Pittsfield Works of General Electric required power at 575 volts. Floor space was at a premium, and this fact made it impracticable to build a fireproof vault near the load center and install oil-filled transformers. Pyranol transformers—three of them, each rated 635 kva, 13,800 v—provided the answer and reduced the over-all costs of the installation.

For your installations, it will pay you to investigate the possibility of savings with Pyranol transformers. Ask your G-E representative for complete information, or write for Bulletin GEA-2637. Address General Electric, Dept. 6—201, Schenectady, N. Y.

GENERAL ELECTRIC

300-71

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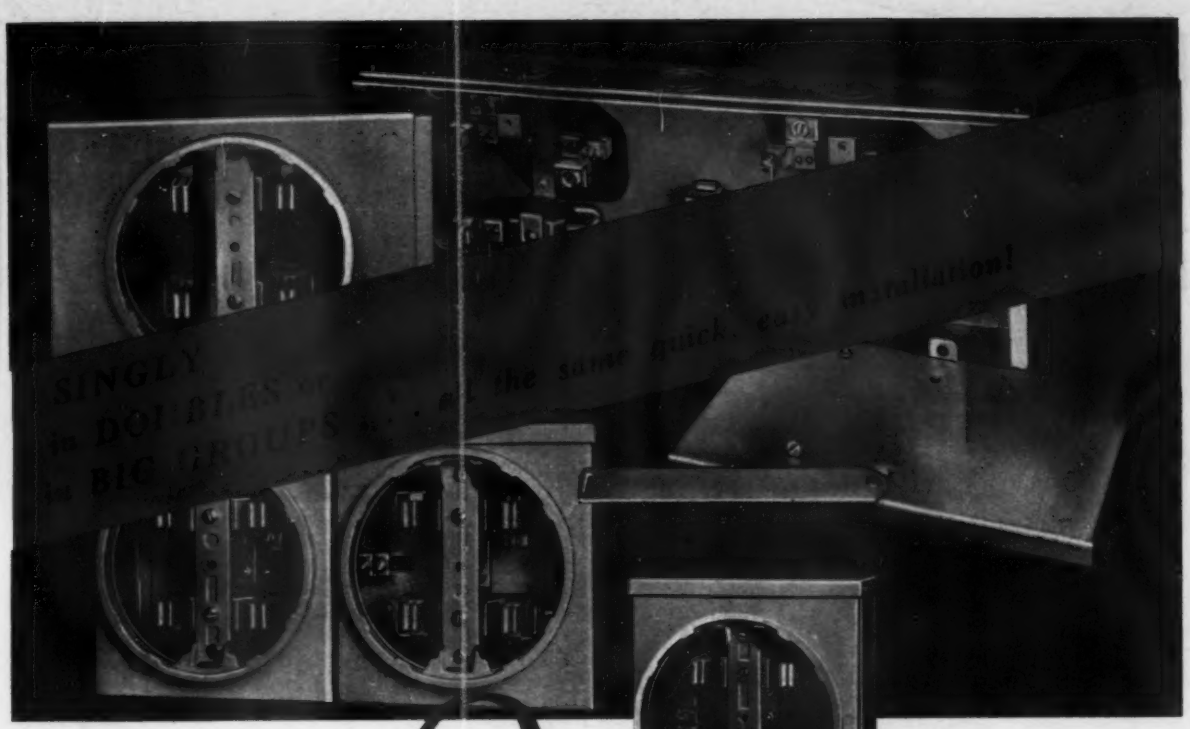

Murray Troughs for SOCKET-TYPE meters

OF all types of socket meter troughs, none are easier to install than these Murrays. Everything FITS. There are knockouts aplenty. Murray solderless connectors make it *easy* to bring in and hold the service wires. Singly, in doubles or in groups of any size desired, these Murray unit-troughs are hung and connected in the same, simple, quick way. This is indeed the modern, economical method. Send the coupon for the facts. Metropolitan Device Corporation, Brooklyn, N. Y.

MAIL THIS COUPON FOR THE WHOLE STORY

METROPOLITAN DEVICE CORP.,
Brooklyn, N. Y.

Gentlemen: Please send me—free of cost or obligation—my copy of "MURRAY METER TROUGHS."

Name_____ Title_____

Company_____

Address_____

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WESTINGHOUSE

THE LINE OF PROFIT

Here is the line of packaged control that lifts you out of low priced competition — gives you the edge in features and advantages, identifies you with high quality electrical work.

COMBINATION LINESTARTER

ALL NEEDED DEVICES IN THE MOTOR CIRCUIT IN ONE EASILY INSTALLED PACKAGE

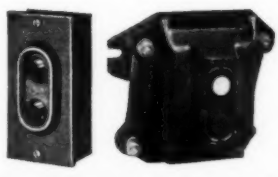
1. Magnetic Motor Starter (push button operated).
2. Manual Disconnect Switch.
3. Motor Overload Protection.
4. Nofuze Circuit Protection.

Safety interlock protects workmen from accidental contact with live parts. Easily and quickly mounted on machine panel or wall. Saves conduit, saves wire, saves labor cost. Gives your customer dependable motor starting, saves him lost production time due to fuse outages. Recommend the Westinghouse Combination Linestarter and identify yourself as the contractor who is right up to date.

PUSH BUTTONS

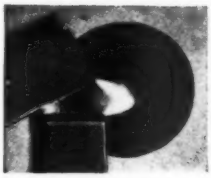
ALL SIZES AND MOUNTINGS
EXPLOSION-PROOF • DUST-TIGHT

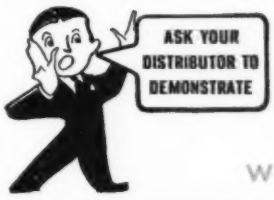
Westinghouse Push Buttons are stocked by your nearest Westinghouse Wholesaler, the size and type you need delivered on the job when you need them.



Westinghouse

MONEY MAKERS



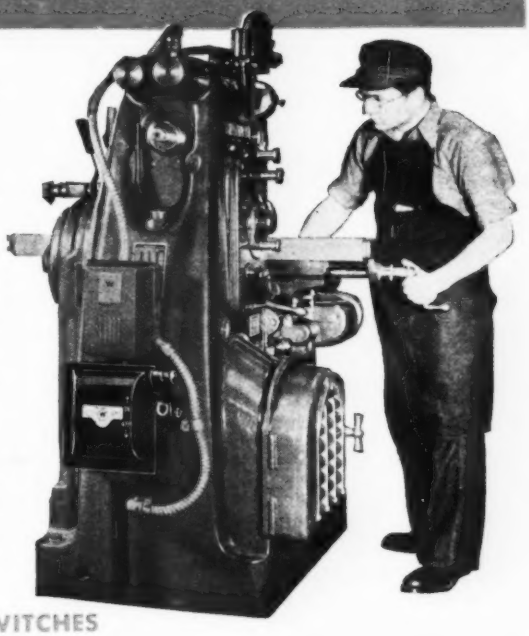


MAINTENANCE REDUCING FEATURES JUSTIFY THE USE OF A GOOD SWITCH

When you bid on the lowest price switch, whether or not you will get the order depends on how little profit you'll take. To protect your profit recommend the Westinghouse Safety Switch. It costs no more than other good switches yet it has features that will break down a strictly price bid.

- diamond pointed jaw and extended blade confines arc to noncurrent carrying parts.
- one-piece copper construction reduces heat loss.
- "De-ion" arc quenchers in 575 and 600 volt switches prevent dangerous flashover, prolong contact life.

Protect your profit with these features in the Westinghouse Safety Switch.



WESTINGHOUSE SAFETY SWITCHES

"DE-ION" MOTOR WATCHMAN

A low-cost manual starter for motors up to 7½ hp:

- Toggle switch indicates "On" "Off" and "Tripped" positions.
- "De-ion" Arc Quenchers protect from flashovers, prolong contact life.
- Safety interlock prevents accidental contact with live parts.
- Bi-metal disc relay protects motor from overload.
- Knockout space in top, sides, bottom or back of case.

J-20821

• FOR YOUR CUSTOMERS BOTHERED WITH FUSE OUTAGE DELAYS

Here is the answer for the customer who is bothered with production time losses due to fuse outages. The Nofuze Circuit Breaker provides positive circuit protection without fuses. Plants report savings as high as $3,000.00 from Nofuze installations.

NOFUZE CIRCUIT BREAKERS

Packaged Control

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Better Seeing and Seeing Comfort with

FLUR-O-LINE

You're Sure to Get
ALL FIVE FEATURES
when you specify
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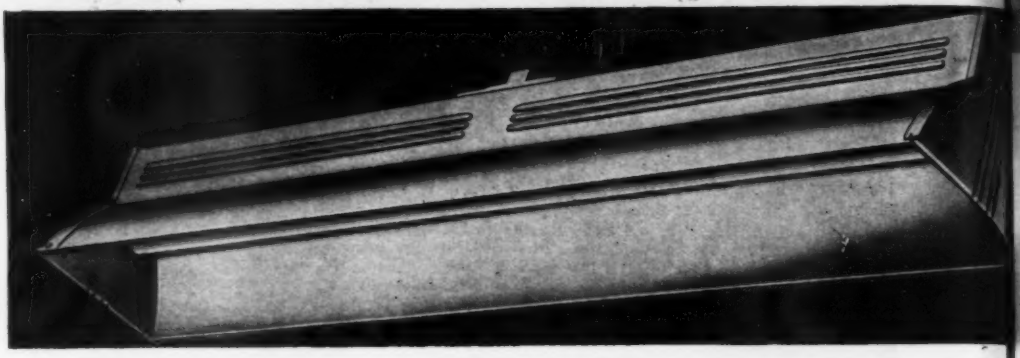
1. Durable, satin-finished Alzak Aluminum reflector.
2. COLD LIGHT, no annoying heat radiation! Place your head or hand close to one of these units and see for yourself!
3. Warranty of Performance and Construction.
4. High Lighting Efficiency.
5. Low Cost.



HOW to Secure *"COLD DAYLIGHT" at Low Cos with these new FLUR-O-LINE Lighting Units

The new Benjamin Flur-O-Line units enable you to secure best results from the new Fluorescent Mazda Lamps which provide the closest approach to natural daylight at the highest efficiency ever secured from such a light source.

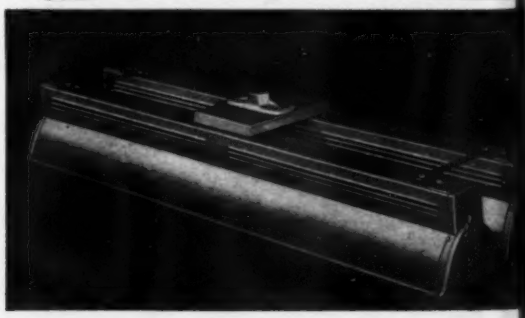
With these new sectional type units, Fluorescent lighting may be fitted to the exact requirements of the work area. In the Flur-O-Line system, the units may be hooked up end to end to form a *long continuous line of light,* or two to six units may be connected side by side to form a wide light source.

Flur-O-Line reflector hoods consist of a highly efficient Alzak-finished aluminum reflector with which is combined a sturdy wiring channel in which can be mounted any standard type of auxiliary and capacitor. Units are available in four lengths for the 18", 24", 36" and 48" Fluorescent lamps. For complete information send for New Device Announcement No. 581. Address the Benjamin Electric Mfg. Co., Des Plaines, Illinois, U. S. A.

Available with high power factor type of auxiliary or necessary capacitors for power factor improvement.

WARRANTY
of Performance and Construction

Benjamin Lighting Units for the Mazda Fluorescent Lamp are certified to comply with the requirements of *Underwriters' Laboratories Inspection Label* affixed to the unit. They are warranted by Benjamin to comply with all recognized safety requirements, illumination, electrical and mechanical standards and to give the light output efficiency and lighting performance as shown on printed specifications and tables for each type of unit. Auxiliaries supplied with these units are certified to be of the type made in accordance with specifications of Mazda Lamp manufacturers.



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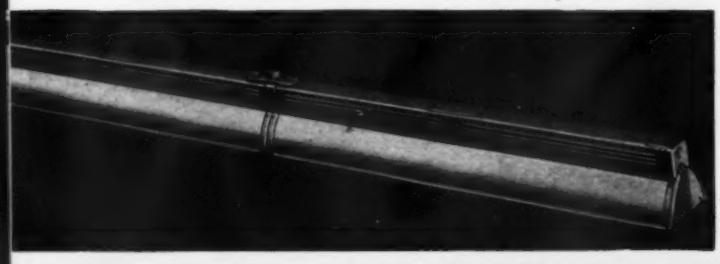
LIGHTING EQUIPMENT

Distributed Exclusively Through Electrical Wholesalers



BENJAMIN ELECTRIC MFG. CO., Des Plaines, Illinois

Gentlemen: Please send me, without cost or obligation, by return mail, your New Device Announcement No. 581 containing complete information on Benjamin Fluorescent Lighting Units.

Name .....

Title .....

Company .....

Address .....

electrical contracting

With which is consolidated The Electragist and Electrical Record
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A SERVICE PAPER for electrical contractors, engineers, motor shops, industrial electricians and inspectors, covering engineering, installation, repairing, maintenance and management, in the field of electrical construction—industrial, commercial, and residential.

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Make it happen to you!

Contractor detects dangerous switchboard—wins $1,000 rewiring contract

A SURVEY of electrical equipment at the printing plant of Marshall & Bruce Co., Nashville, Tenn., showed that the switchboard equipment was dangerously inadequate and overloaded; feeder circuits were heating badly due to overloads; insulation was in bad condition.

Installation of a new three-phase, four-wire distribution system made it possible to operate all equipment at top speed, which formerly was impossible. Cost of the new wiring system using improved Anaconda wire and cable was about $1,000. Saving in power losses returned this cost in nine months.

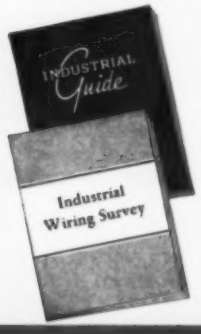
L. C. Hansberger, president, Electrical Construction, Inc., Nashville, Tenn., whose firm installed the new wiring system at Marshall & Bruce Co. The latter firm says: "The electric current saving more than paid for this entire job within a period of nine months."

They turn off dripping faucets—show them how to stop far costlier, invisible electrical leaks!

OVERLOADED electric circuits aren't as easy to spot as dripping faucets—at least not for the nine out of ten plants that estimates show are suffering important power losses from antiquated, outworn circuits. But, you have the equipment and experience to show them where and how inadequate wiring is piling up power expenses.

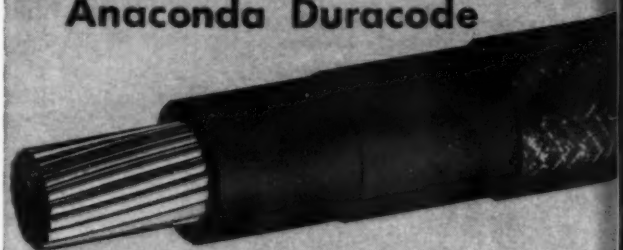
Remember—nine out of ten plants are prospects. So, use that equipment and experience of yours. You'll be getting three- and four-figure jobs instead of small repair work.

Your Anaconda Distributor Will Help You



The two books shown here can be obtained from your regular Anaconda distributor. They give complete directions about making plant wiring surveys . . . provide a step-by-step guide for making a general survey on wiring, motors and lighting . . . a report section for listing conditions found in each feeder, subfeeder and branch circuits . . . recommendations for plot sketches and plans of existing wiring system layout. Ask your Anaconda Distributor for your copies today. 28816

Anaconda Duracode



Duracode insulation represents the first successful attempt to combat the destructive effect of heat and oxidation with one all-purpose building wire. Write for the facts about this improved industrial cable.

USE MODERN IMPROVED *Anaconda Wire & Cable*

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SEPTEMBER, 1939

"We The People—"

THREE TAILORS located on Tooley Street, in London, once felt a grievance against the king. This was in the good old days when men wore gay brocades and satins and tailors felt important. So these three presented a joint petition to Parliament. It began—"We, the people of England—"

IT IS NOT HARD for small groups to get into this frame of mind. With common interests, they develop a joint enthusiasm and out of it comes a "cause". We have a good example in the electrical industry, where for years a group of power company men have been battling against the "cost of wiring", which they consider too high.

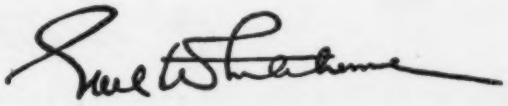
THESE CHAMPIONS GIRDED ON their shining swords and felt they were crusading for the Lord. Their sincerity deserves the respect of all electrical men. But as so often happens, those who opposed them, they considered as allied with anti-Christ.

NOW, THE ELECTRICAL INSPECTORS and the electrical contractors have consistently opposed the lowering of the safety standards of the Code. They have vigorously denied that present rules are holding back the sale of more adequate wiring. And year after year, there has been a warfare of conflicting opinions and clashing personalities.

FINALLY, PRAISE GOD!—the utility men defined what they wanted in eight proposals. They have now spent a year in promoting these proposals in the field. The inspectors have passed regional resolutions. The NFPA Electrical Committee has named the day for decision. And on page 13 is the first clear expression of the attitude of the contractors of the country.

WHAT DOES IT SHOW? It shows that electrical contractors are not rigidly opposed to change in the Code. They are strong for safety—like anybody else. But they too differ as to what is safe. However, the majorities are definite—as the Electrical Committee will observe.

CONTRACTORS HAVE A RIGHT to their opinion. They are not asking to speak as "We the people—." But they do demand that their special knowledge and interest in matters of wiring be recognized. They demand also that when such a difference of opinion again arises over the Code, it be made definite and factual at once, not dragged through fifteen years of demoralizing argument.



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"JUST A MINUTE MR. CONTRACTOR!

—THAT ISN'T ALL YOU GET."

When you do business with Graybar, you get more for your money than just the materials you buy. You get a dependable product for a fair price, of course . . .

But you get other things, too.

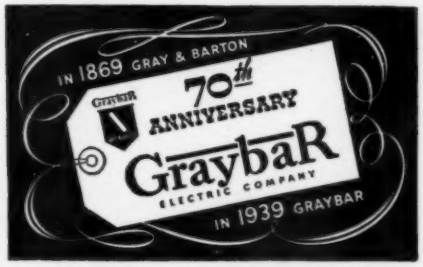
For example, you get a solid Graybar guarantee backing up every sale.

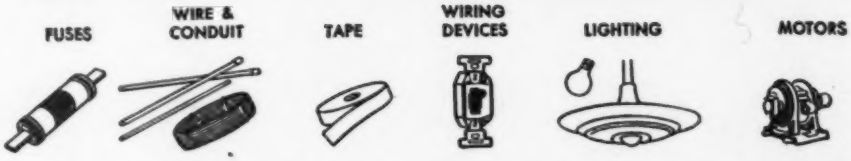
You get prompt "action service" . . . either at convenient pick-up counters . . . or by truck delivery . . . to bring you what you want, *when* you want it.

You get the willing assistance of Graybar men experienced for years in serving contractors' needs. This experience—as indicated by the tag below—goes back through 70 years of growth with the electrical industry.

You get the benefit of a nearby Graybar warehouse, carefully and amply stocked with the materials you will need. Furthermore, Graybar is glad to cooperate with contractor customers in building up special stocks for specific needs.

You get . . . in other words . . . *plus value* for every dollar you spend with Graybar. And you deal with a responsible, financially strong, and permanent source of supply. You can depend on products from Graybar. You can depend on Graybar!





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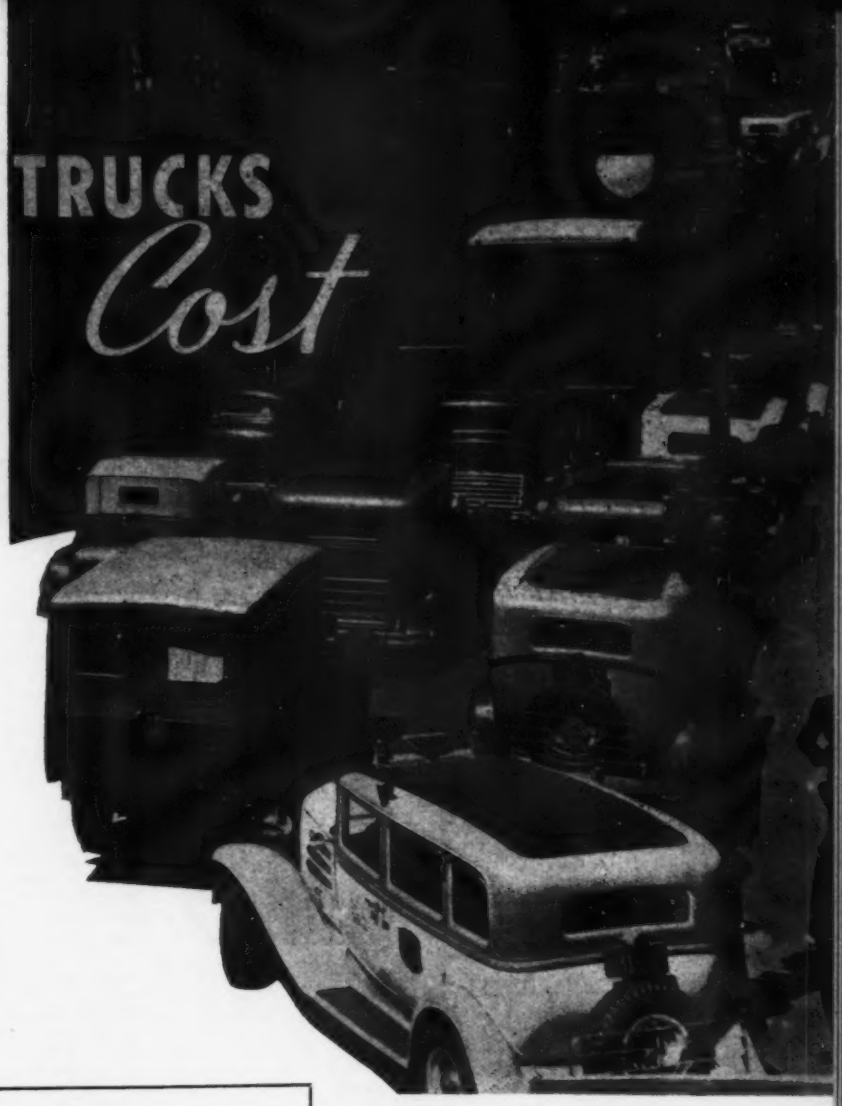
WHAT YOUR TRUCKS Cost

By
Arthur Roberts

An independent auditor and accountant, who is specializing in service to electrical contractors.



Traffic, repairs, gas, oil, accidents — these things make profit or loss in your trucking operations. Mr. Roberts shows what these costs mean to fifty contractors in the east.

LABOR costs in this industry are difficult enough to control without aggravating the situation with wasted transit time. So the electrical contractor, who makes sure that labor is not held up by truck delay on contract jobs, has gone a long way toward maximum profits. Thinking in terms of transit time is important.

There are five main causes for lost time in the electrical contracting business—

1 Poorly planned work.
2 Soldiering by journeymen.
3 Incompetency, resulting in slow work.
4 Poor workmanship, necessitating do-overs.
5 Delays in delivery materials due to inefficient transportation.

Contractors usually keep close check on the first four causes but overlook the fifth. Even though the transit time does not directly involve job labor, as when a truck is used for miscellaneous errands or pick-ups, costs increase with inefficient operation because the driver's wage is a big item of expense. When not behind the wheel, he may be used for other work. By cutting down transit time, some contractors get 20 per cent or more work out of drivers.

When a grocer's truck wastes transit time, he pays excessive operating costs per order. But when an electrical contractor's truck wastes transit time, he not only pays too much for deliveries but often pays high-priced journeymen for enforced idleness. Transit time wasted usually means labor time lost unnecessarily and that is why the adequacy of job transportation facilities is an important factor to profits in this industry.

Much has been said and written about the savings made possible through the utilization of modern rolling stock, but only in general terms. There has been nothing definite in the way of comparative figures showing the cost of operating old trucks versus new. An analysis, just completed, covering 52 trucks operated by 41 electrical contractors, gives such comparative data. Operating costs upon which we base the accompanying comparative statements cover 1937 when old trucks were run and 1938 when new trucks were purchased.

We kept a record also of the transit time on 101 contract jobs handled by 34 electrical contractors. We divided them into two groups, those netting less than three per cent and those netting more than this percentage. The bigger profit-makers spent 22 per cent less transit time than those in the lower brackets.

Another discovery was made when the rolling stock of the headliners was checked for adequacy. It was more modern! Its age averaged three years, whereas, the age of the low-profit boys averaged five years. This is a good indication that profits in this business depend to a great extent on the adequacy of commercial trucks.

Gas and Oil—Statement A, for example reveals a high rate of oil consumption. Contractors serving as "guinea pigs" for this research showed monthly savings up to $11 on oil after buying new trucks. Where a contractor operates three or four trucks, the loss on oil alone may exceed $500 yearly if the rolling stock is jalopy. Statement B shows that gasoline gave approximately 30 per cent more mileage after modernization, oil 45 per cent.

Pay Load—The average payload was higher after modernization because bodies

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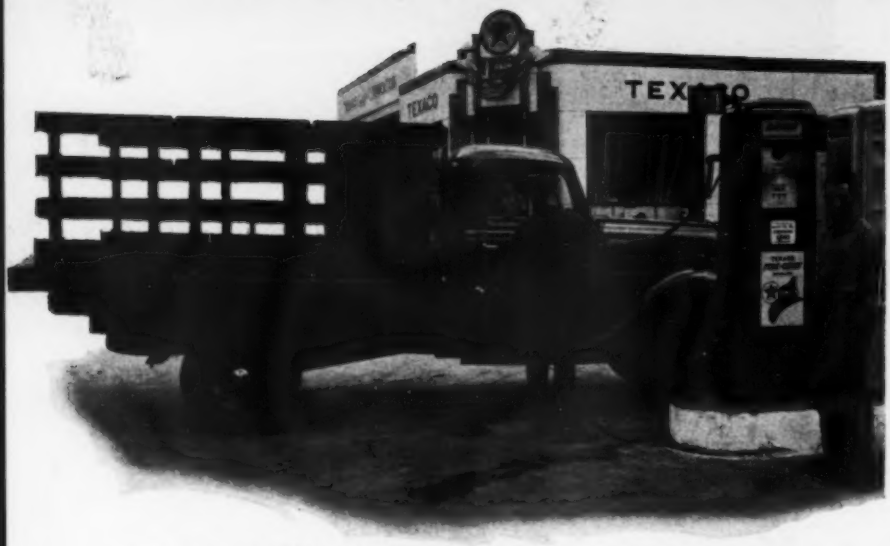

STOP FOR GAS—*Old trucks have big appetites and stopping for gas wastes time. It all gets into the balance sheet on the wrong side.*

of late model trucks are roomier, easier to load and unload, can carry bigger payloads more conveniently at lower delivery expense per unit, with fewer returns for re-loads and with less likelihood of lost labor time.

We know of electrical contractors who are hobbling along with undersized trucks. Business has increased but their truck capacities remain the same. They try to economize by making one truck carry more mileage than it should. The figures compiled on this research show that the number of miles a truck is operated per day affects cost. A high mileage gives lowest cost per mile but a truck should not be run extra miles to get a low cost per mile because delays likely to result from such an arrangement will build up job labor expense.

Our experience shows that too many users operate trucks with capacities insufficient to handle maximum loads. Their trucks are big enough for, say, 75 per cent of the loads, but too small for the remainder. To handle the bigger payloads, the trucks must make more trips and that runs up operating expense, because of time spent on return trips, additional loadings and unloading and job hold-ups. The roomier truck provides capacity for peak loads and does not penalize on smaller loads.

Some contractors use small trucks because they assume they are more economical on gas and oil. This analysis shows that gas and oil, while a monetary factor over the year, cost comparatively little per operating mile. Driver's time, wages, repairs and departmental overhead are the big items and they increase when payloads are inadequate. Likewise, there is the possibility of lost time for job labor.

In some cases, trucks covered in Statement A were in good working order but costly time-wasters. This was because they were not the right body models. Perhaps, it was a panel body, where a stake or pick-up truck would be more suitable.

Work per Day—Stops per day increased after modernization because newer trucks are speedier. Slower, older trucks compel a contractor to use more rolling stock than necessary or to overwork it. The average reduction in transit time, according to our analysis, was 12 per cent after truck replacement. Using this research as a yardstick, if a contractor has an old truck running four hours daily, 1,000 hours in a working year of 250 days or 125 eight-hour days, he can save 120 hours or 15 days operation by investing in a new truck.

At the average operating cost per mile shown on Statement B, he will save $64.47, figuring average mileage at 15.2 as shown, plus more prompt delivery and pick-up of materials and equipment with less likelihood of lost job time. Where a contractor owns more than one truck and keeps them in work more than four hours daily, his saving would be substantially increased. This economy is due solely to the greater speed and acceleration of modern trucks and is only one of the advantages of replacement.

Lost Time—Loading and unloading time runs higher on old trucks. In connection with this field study, we selected 15 jalopies, still used by electrical contractors. We compared their loading and unloading time for three weeks with the same number of new trucks taken from the group on Statement B and subject to similar working conditions. Loading and unloading time averaged 18 per cent less on the new trucks, because their bodies were better suited to requirements and there was adequate equipment, such as hoists and winches, to handle heavy stuff.

Too many contractors lack such equipment and it is costing them money in lost time. A ten minute delay here, a five minute delay there, three minutes lost elsewhere, mount up in time. At the end of the year, the grand total may mean red ink.

In this analysis, 22 per cent of the transit time lost meant time wasted by labor waiting for materials or personnel transportation to or from jobs. This excessive labor cost had more to do with keeping profits low than the higher costs directly chargeable to truck operations.

Repairs—"Miles per garage call" means the number of miles a truck travels before being garaged for repair service. Before replacement, contractors in the group shown on Statement A, had as many as three garage cases a month. The average covering 1937 shows that a garage call occurred every 19 weeks on old trucks. But after replacement, garage calls averaged one every 10 months, and they were often only for minor ailments.

Repairs on old trucks averaged more than double the expense on new trucks. This saving will run into hundreds of dollars yearly for contractors with small fleets. Time out for repairs involves more than just the repair bills. It necessitates reorganizing the delivery schedule, delays, lost time, excessive labor costs, dissatisfied customers.

One reason for high repair costs on Statement A was due to overloading under-capacity equipment. Contractors either tried to get by with smaller tonnage trucks or used one truck when two should be rolling.

Poor weight distribution contributed its share of breakdowns on Statement A. Bodies were not adequate for the loads carried. If a truck is under-capacity, replacement with a larger truck will lower costs of operation.

Contractors reported that rears, transmission and brakes give most trouble on old trucks. Rears pull out, transmissions go bad and brakes fail to hold properly, requiring continual servicing. Modern trucks have rugged rears, big drum diameters and large lining areas for long and dependable brake life, quicker stops, and equalized braking action better for straight stops, with easy pedal pressure.

Accidents—Investigation showed that

STATEMENT A—OLD TRUCKS

COST OF ELECTRICAL CONTRACTORS' TRUCKS BEFORE REPLACEMENT—OPERATING DATA FOR 1937

No. trucks	52
Miles per gallon of gasoline	10.3
Miles per quart of oil	101
Average payload in pounds	1,073
Average mileage per day	15.2
Average stops per day	10
Average miles per garage call	1,713

OPERATING COSTS PER MILE IN CENTS—1937

Gasoline	$.0172
Oil and grease	.0025
Tires and tubes	.0041
Maintenance and repairs	.0460
*Driver's wages	.1509
Departmental overhead, including insurance, garage rent, accident repairs, interest, depreciation, license and sundry expenses covering truck operation	.0621
Total operating costs per mile	$.2828

*Only driver's time spent on haulage or delivery considered. Shopwork or other duties allocated to proper departments.

STATEMENT B—NEW TRUCKS

COST OF ELECTRICAL CONTRACTORS' TRUCKS AFTER REPLACEMENT—OPERATING DATA for 1938

No. trucks	54 *
Miles per gallon of gasoline	13.8
Miles per quart of oil	146
Average payload in pounds	1,321
Average mileage per day	19.6
Average stops per day	26
Average miles per garage call	4,711

*Two contractors bought additional trucks, 2 new for one old, increasing the "after" total by 2. The inclusion of these figures did not affect averages one way or the other.

OPERATING COSTS PER MILE IN CENTS—1938

Gasoline	$.0131
Oil and grease	.0017
Tires and tubes	.0032
Maintenance and repairs	.0231
Driver's wages	.1001
Departmental overhead, including insurance, garage rent, accident repairs, interest, depreciation, license, and sundry expenses covering truck operation	.0604
Total operating costs per mile	$.2016

AVERAGE SAVINGS PER TRUCK AFTER MODERNIZATION

Savings per mile	$.0812
Savings per day	1.59
Savings per 1,000 miles	81.20
Savings per year of 250 working days	397.50

accident repairs and claims, resulting from mechanical deficiencies, were higher on old trucks, increasing departmental overload. It would seem that electrical contractors should realize the importance of having the brakes and other essentials on their trucks always in tiptop condition. Yet, four old trucks belonging to contractors in the group providing this research material, had been in accidents because their braking systems did not function properly.

Depreciation Costs—Depreciation was higher after modernization because many old trucks had been written off the books by 1937 or the trade-in allowance used to offset it. A contractor's truck should be written down 20 to 25 per cent a year.

Interest on truck investment, of course, was not lower after replacement because old trucks are worth comparatively little. This explains why departmental overhead runs about the same before and after modernization. Certain departmental items were lower after modernization but the higher charges for depreciation, interest on investment and insurance offset them.

A recapitulation of the figures on Statement B shows that the average saving after modernization is $397.50 a year. Considering the life of a truck as five years, this saving totals $1,987.50. As a truck gets older, the yearly saving will be less. But if we cut the saving in half, making it $993.75, it is still a monetary achievement worth consideration. These figures show how important it is to keep rolling stock up to date, since haulage and delivery expense take such a substantial slice of your sales dollar that often it is the deciding factor as to whether there will be a profit or loss. Based upon our findings, three old, inefficient trucks would be wasting $1,192.50 a year, which comes out of profits.

Remember that a one per cent saving on cost of truck operation for an electrical contractor doing $25,000 yearly means $250 more in the bank. If that contractor nets five per cent profit, that means that a one per cent saving on truck expense, is equal to a $5,000 or 20 per cent increase in sales, because $250 is the net profit on this additional business. Unless they price-cut foolishly, many contractors cannot attain a 20 per cent increase in sales.

Variables—The size of the establishment. the model of trucks used, the areas covered or the number of trucks in a fleet, were not considered in this research. The main objective was to get factual data on the benefits derived from utilizing streamlined rolling stock.

One may contend that many variable factors affect truck operation, that some contractors have different operating costs or problems than others, that cost of license, taxes, wages, tires, gas, oil, vary in different territories. Charges for depreciation, insurance, taxes and interest depend upon the initial price of the truck. Types of roads covered, weather, climate, season of year, relative frequency of stops, are variable.

This contention is true but it does not nullify the findings of this survey. These figures were gathered from contractors, who, in the aggregate, had to cope with all these problems.

Replacement Policy—Contractors who operate trucks at minimum expense, report that the best rule to follow on truck replacements is to trade-in as soon as the unit becomes expensive to run or overhaul, regardless of age. Sometimes a considerable saving may be effected by trading in an old truck when tires need replacement.

Excessive tire wear was shown by the records we analyzed to compile Statement A. Tires on old trucks sometimes blew before 10,000 miles. Tire mileage increased about 25 per cent after modernization. Obsolete braking systems, bad alignment and other defects increased tire expense. A contractor's truck working in congested sections with many stops and starts in traffic goes bad quickly on tires, if the equipment has jalopy drums or brake linings.

Labor Losses—Figures in Statement A do not include labor time lost due to inadequate rolling stock, because we are comparing operating costs of trucks only. The inclusion of outside figures would have thrown the averages off and made it difficult to appraise before-and-after operating efficiencies. Moreover, unless a supplemental investigation were made, it would be impossible to obtain such information accurately, because labor losses due to excessive transit time are not detailed on job records. Definite figures could be gotten only with special recordings.

From our work on this research, however, we feel safe in estimating that contractors lose up to 10 per cent a year on labor when trucks are inadequate. In other words, if you pay a journeyman $10 a day for 250 working days or $2,500 in all, you may lose as much as $250 per man if you operate jalopy rolling stock. From whichever angle one figures, truck modernization is a profitable investment.

After the close study that this research involved, we feel safe in advising that it is time for a large percentage of electrical contractors to become truck-conscious. They should make replacements, not only to reduce operating costs and increase net profits but to acquire rolling stock of distinguished streamline appearance that will be a moving advertisement for the business.

TIME OUT—*"Miles per garage call" sounds like an accounting technicality, but it all runs into unexpected money charged to overhead and taken out of profits.*

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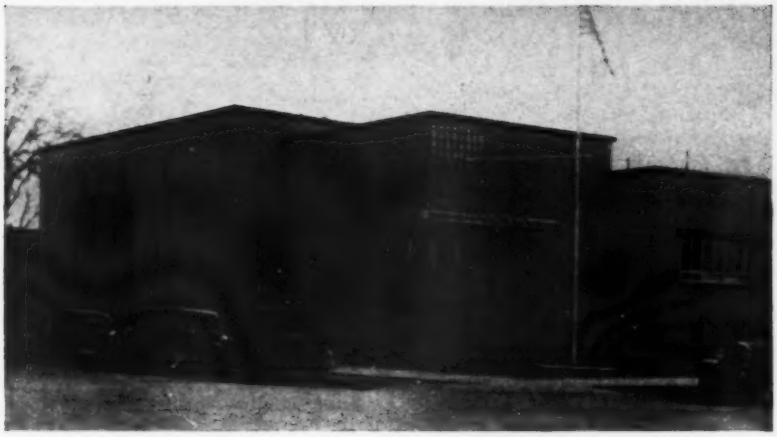
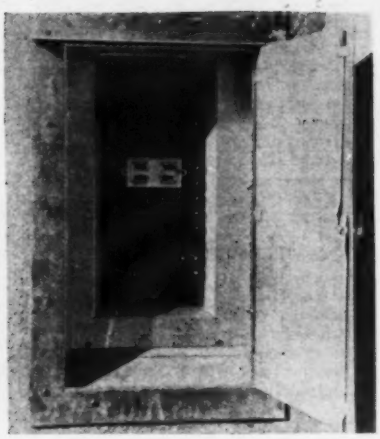


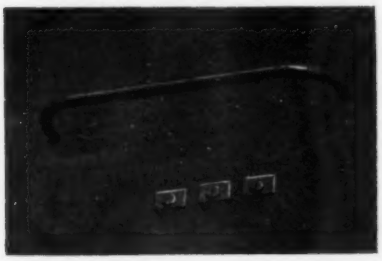
UNIQUE STRUCTURE—*The Fresno School Administration building combines office quarters and auditorium facilities for indoor and outdoor ceremonies.*



REAR WALL *outlets for spots, floods or movies employ a flush cabinet, housing twistlock receptacles and switch controls for three colors.*

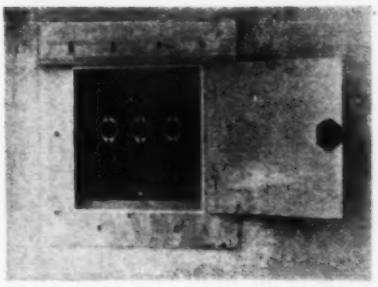
Some Wiring Design Ideas

Developed in the Fresno School Administration Building, they are applicable to both office buildings and schools.



OUTDOOR EFFECTS *are readily set up. A courtyard pipe rail for spotlights has weatherproofed outlets for three colors nearby, while several steel eyes are available for rigging scenery.*

CODED CONTROLS *in this rain-shielded courtyard panel are distinctly marked red, white and blue for easy selection by amateurs.*



BECAUSE it combines both an office structure and a school, the recently finished Fresno, Calif., city school administration building wired by Tom Robinson, electrical contractor, has characteristics of both. But several novel features of both lighting and of wiring were incorporated into the plans by Carl F. Wolf, electrical engineer for Valley Electrical Supply Co., Fresno, who develops business for contractors, by his work with architects. Location of lighting units with respect to the office space, location of lighting switch controls, and of telephone and convenience outlet circuits depart from generally accepted practices for a number of good reasons. These ideas may well be applied to office building lighting and wiring and to schools.

In addition to the office spaces in this unique building, a small auditorium is provided for teachers' institute meetings, parent-teachers meetings, or other similar gatherings in which the school department is involved. The facilities for lighting the stage of the small auditorium may be transferred to an outdoor court yard for outdoor plays and meetings. This is perhaps the most ingenious feature. The accompanying pictures show details of these facilities which were provided as a part of the basic wiring design. They also illustrate how thoroughly provision for the future needs were made.

LOBBY BOOTH *effects harmonize with a glass brick front. Work spaces have built-in ceiling panels, while lights back of opal glass panels illuminate the upper front of booth.*

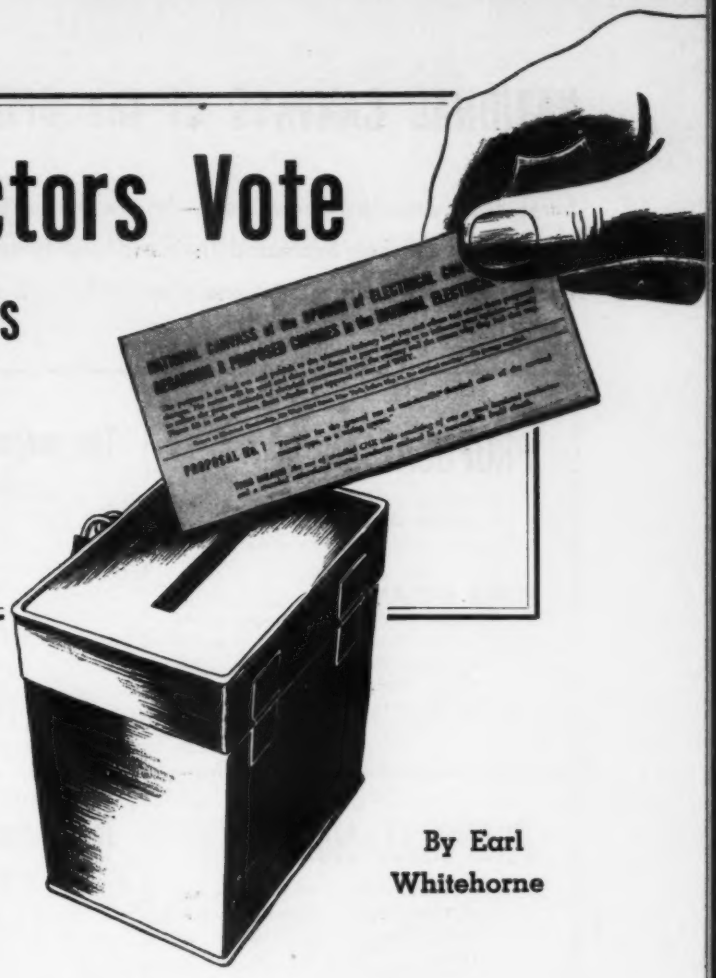
OFFICE COMFORT *in these air conditioned quarters include ceiling lighting controlled at the same angle as natural light from shaded windows. Switches are at columns near desks, also at entrances.*

UMI

1000 Contractors Vote

on the Code Proposals

National Canvass of Electrical Contractors Approves Two Changes and Opposes Six. The First Broad Reflection of What the Electrical Contractor Really Wants



By Earl Whitehorne

EIGHT changes in the National Electrical Code have been proposed by the power companies. These eight proposals have crystalized out of ten years and more of controversy, in which the utility men have contended that the Code is holding back the sale of more adequate wiring capacity in industrial, commercial and residential buildings. It is blocking progress, they say, because its rules are too restrictive.

The electrical inspectors of the country and the electrical contractors have lined up on the other side to defend the Code. They have resisted the lowering of existing Code rules, insisted on the maintenance of present safety standards. It has been a long hot fight, based largely on conflicting opinions as to what is safe and what is not.

Finally the power companies, working through the Association of Edison Illuminating Companies, drew up recommendations for eight changes in the Code. They embrace the use of covered neutral non-metallic sheath cable, bare neutral in conduit, larger utilization of the space in conduit, thin wall insulation and other innovations. The Edison Electric Institute put a man in the field who for the past year has been promoting these proposals in local meetings held by the power companies.

This has fanned the fire of the controversy. Inspectors' meetings in various sections have passed resolutions against some of the proposed changes. The executive committee of the National Electrical Contractors Association published a resolution condemning bare neutral in the name of its membership. A number of local contractors' associations in different cities have likewise voted against certain of the proposals. *But there has been no clear expression by the electrical contractors of the country as individuals, as to what they want.*

Now, we believe that the men who install electrical systems are vitally concerned in all changes in wiring practice and in the Code that governs it. So *Electrical Contracting* wrote a letter to 10,000 electrical contractors and sent them a ballot to fill in. We asked them to state their attitude toward each of the eight proposals—whether they approve or oppose the changes. And there were no weasel words in the letter or the ballot.

The purpose was made plain. We were not trying to prove anything. We were not attempting to influence any man's opinion. We were just trying to obtain a clear reflection of the present attitude of electrical contractors and the reason why they feel that way.

From these 10,000 contractors, we received back 887 ballots. Some of these ballots, represent votes by 20, 30 or maybe 50 contractors, who had reviewed the proposals in local meetings and sent in their joint opinions. The total vote received, therefore, covers the attitude of way in excess of 1000 contractors, although only the number of ballots is recorded here. It is a true and very satisfactory sampling of the entire industry, both as to location and the size and character of the business of the individual contractors voting.

Here then, for the first time, the electrical contractors of the country speak their minds as to these eight proposed changes in the National Electrical Code. They express their attitude definitely on each proposal. There is no more unity of thought than would be found on any subject among any other thousand American citizens. But the majority opinion stands out clear—and the size of the majority.

When the NFPA Electrical Committee meets in November to pass on these proposals, there can be no question as to what the electrical contractors want done and why they want it. And this was the reason why the canvass was made.

The results of the vote for the several proposals are presented separately on the following pages.

UMI

NATIONAL CANVASS of the OPINION of ELECTRICAL CONTRACTORS

Some 1000 electrical contractors—border to border and coast to coast—have just expressed their attitude toward the eight proposed changes in the national Code. Here is their answer!

PROPOSAL No. 1

"Provision for the general use of non-metallic sheathed cable of the covered neutral type, as a wiring system."

THIS MEANS the use of so-called CNX cable consisting of one or more insulated conductors and a stranded uninsulated neutral conductor enclosed in a non-metallic braid sheath.

The majority of contractors OPPOSE this change!

584 contractors say "No!"—because—

1—They consider it unsafe because it has no metallic sheath.
2—They object to lowering standards in this way.
3—They fear injury during installation and from rats.
4—They fear short circuits at outlet boxes.

237 contractors say "Yes!"—because—

1—They consider it safe.
2—They think it would be easier to install and increase business.
3—Eight contractors report satisfactory experience.

PROPOSAL No. 2

"Provision for the use of duplex and multiple-conductor cables of covered neutral type in raceways of all classes."

THIS MEANS one or more insulated conductors cabled with a stranded uninsulated neutral conductor in a common braid covering.

The majority of contractors OPPOSE this change!

508 contractors say "No!"—because—

1—They fear a hot neutral caused by reversal of polarity.
2—They believe standards should not be lowered here.
3—They fear short circuits at outlet boxes.
4—They object to increased stocks involved.

290 contractors say "Yes!"—because—

1—They see in it a simplified system, easier to pull.
2—They believe it will create more work.
3—They see room for more copper in present conduits.

BUT out of this vote—

46 contractors approve for existing conduits only.
84 contractors approve for new work only.

PROPOSAL No. 3

"Provision for bare neutral in conduit and electrical metallic tubing for general use."

THIS MEANS uninsulated neutrals run together with insulated hot wires.

The majority of contractors OPPOSE this change!

481 contractors say "No!"—because—

1—They see too much risk of short circuits at pull or outlet boxes.
2—They fear damage to hot wire insulation in pulling in bare neutral.
3—They think standards should not be lowered here.
4—They fear a hot neutral caused by reversal of polarity.

374 contractors say "Yes!"—because—

1—Extra room will be available in conduit.
2—It will bring lower cost of wire and smaller conduit.
3—They believe insulation is not necessary if grounding is right.
4—Eleven claim satisfactory experience.

BUT out of this vote—

207 contractors approve for existing conduits only.
231 contractors approve for new work only.
45 contractors approve for fireproof buildings only.

UMI

REGARDING the EIGHT PROPOSED CHANGES for the NEXT CODE

"Electrical Contracting" asked 10,000 electrical contractors to state whether they are for or against each of the proposed changes—and to give the reason why they feel that way.

The majority of contractors APPROVE this change!

563 contractors say "Yes!"—because—

1—They see the use of more wire in conduits or smaller conduit reducing costs.
2—They believe it will help speed rewiring of old buildings.

244 contractors say "No!"—because—

1—They fear thin insulation will damage in pulling.
2—They fear danger of overheating with more wires in conduit.

BUT out of this vote—

129 contractors approve for existing conduits only.
68 contractors approve for new work only.

PROPOSAL No. 4

"Provision for the general use of 'thin wall' insulation."

THIS MEANS the use of new insulations of high dielectric strength which permit smaller outside diameters, allowing more conductors or larger copper in existing conduits.

The majority of contractors APPROVE this change!

519 contractors say "Yes!"—because

1—They see it helping to bring old installations up to date.
2—They believe it will encourage use of extra copper for increased loads.

309 contractors say "No!"—because—

1—They think it would cost more to pull new wires.
2—They fear it will reduce the flexibility of conduit systems.

BUT out of this vote—

29 contractors would modify rule to apply to short runs only.
60 contractors would approve for additional conductors only.
214 contractors would approve if all conductors are replaced.

PROPOSAL No. 5

"Modification of the conduit area rule, in old installations, to permit utilization of the waste space for additional wire required by increased loads."

THIS MEANS the use of more than 40 per cent of the space within the conduit area, where more wires can be pulled in.

The majority of contractors OPPOSE this change!

486 contractors say "No!"—because

1—They fear insufficient mechanical protection.
2—They say it would reduce standards.
3—They fear it is too easily tampered with.

359 contractors say "Yes!"—because—

1—They believe it would reduce cost and increase business.
2—They say that if it is right for the service it is O.K. for general use.

BUT out of this vote—

31 contractors would approve for range circuits only.
35 contractors favor the change for feeders only.

PROPOSAL No. 6

"Recognition of service cable of the covered neutral type for general indoor use."

THIS MEANS an extension of Proposal 1 to permit the use of covered neutral cables now approved for services, in range circuits and interior feeders.

UMI

CONTRACTORS' ATTITUDE TOWARD CODE REVISIONS

Many local electrical contractors associations registered their opinion by formal resolution, for the entire membership. But these group ballots have been counted as single votes.

PROPOSAL No. 7

"Removal of requirements for mandatory use of rigid conduit in theatres, elevators and hazardous locations and of metal clad wiring in garages."

THIS MEANS changing existing restrictions, to permit other wiring systems to be used in these areas.

The majority of contractors OPPOSE this change!

748 contractors say "No!"—because—

1—They say safety is too important here to lower standards at all.
2—They feel that any change would be against public interest.

79 contractors say "Yes!"—because—

1—They think armored cable is safe enough.
2—They think that thin wall conduit is safe enough.

PROPOSAL No. 8

"Deletion of rule requiring conduit to be shipped in 10 ft. lengths."

THIS MEANS that conduit could be shipped in longer or shorter lengths.

The majority of contractors OPPOSE this change!

439 contractors say "No!"—because—

1—They say longer conduit is too long to handle.
2—They say shorter conduit is more liable to damage.
3—They fear costly increase in stocks.

215 contractors say "Yes!"—because—

1—They believe longer conduit would help in concealed and underground work because of fewer joints to leak.

WHAT IT ALL MEANS

From this broad expression of the opinion of more than 1000 electrical contractors, these conclusions stand out—

1. Electrical contractors are not opposed to progress in the art. They welcome thin wall insulation.

2. Contractors are ready to try the crowding of more wires into conduits in order to make it possible to install more capacity in commercial buildings.

3. Many contractors are disposed to accept the wider use of covered neutral cable, service cable and even bare neutral, believing that they may prove safe. But the majority is definitely opposed.

4. When it comes to taking chances with public safety, however, by lowering wiring standards in theatres and hazardous locations, contractors are solidly opposed.

5. This vote refutes the charge that the electrical contractor is opposed to any changing of the Code. Being a local minded individualist, the contractor is doing his own thinking in regard to safety and has his reasons for it. He is ready to express them, if somebody asks.

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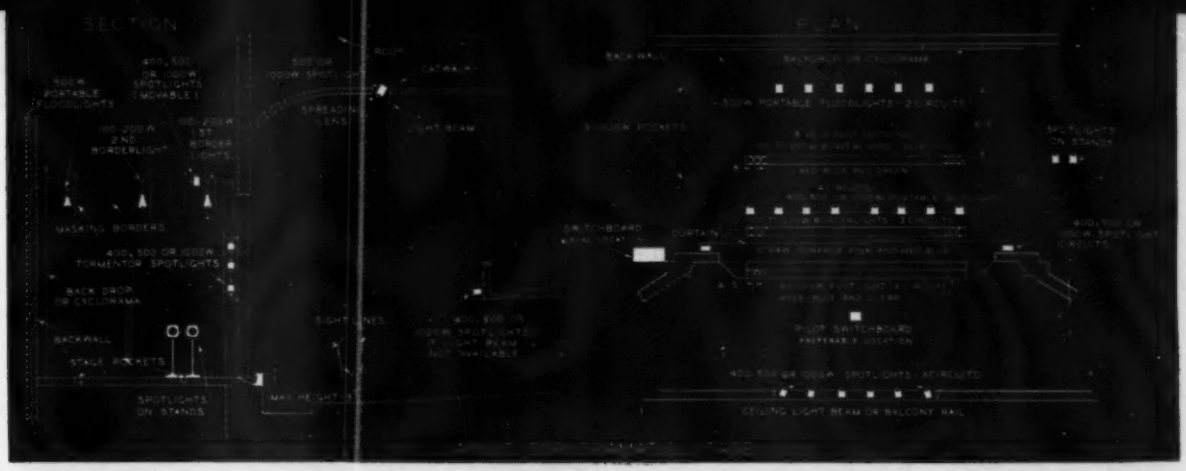
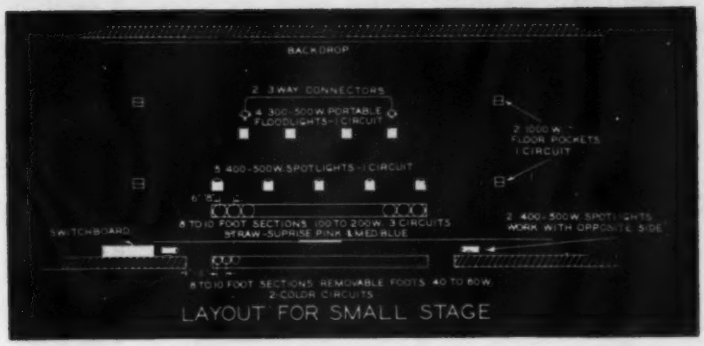



BACKDROP
2 3 WAY CONNECTORS
4 300-500W PORTABLE FLOODLIGHTS-1 CIRCUIT
2 1000 W FLOOR POCKETS 1 CIRCUIT
5 400-500W SPOTLIGHTS-1 CIRCUIT
8 TO 10 FOOT SECTIONS 100 TO 200W 3 CIRCUITS STRAW-SUPRISE PINK & MED BLUE
2 400-500W SPOTLIGHTS WORK WITH OPPOSITE SIDE
SWITCHBOARD
8 TO 10 FOOT SECTIONS REMOVABLE FOOTS 40 TO 60W 2-COLOR CIRCUITS
LAYOUT FOR SMALL STAGE

Stage Lighting Suggestions

AMATEUR dramatics have become very popular again in recent years. Schools, churches, "Little Theatre" groups, are all finding public acceptance for their presentations. And in amateur dramatics, as in professional, lighting plays a prominent part.

It is well to recommend a standard or semi-standard lighting plan, so maximum flexibility will be obtained and, as new equipment is bought and installed, it will fit into and complete the original plan. These sketches show proven layouts for the dramatic stage and the small stage. The table gives the equipment recommended for both.

Where it is impossible to get the customer to purchase the complete equipment according to this plan, the following order of preference in equipment purchase is suggested: (1) First borderlight or its equivalent. (2) Half of overhead lighting—hanging spotlights. (3) Portable floodlights. (4) Footlights. (5) Spotlights. (6) Balance of overhanging spotlights. (7) Tormentor spotlights. (8) Second borderlight. (9) Spotlights on stand.

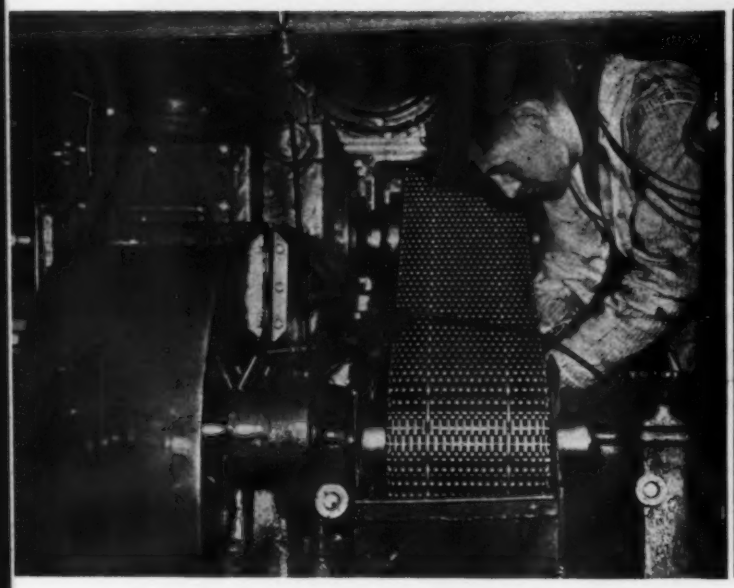
Requirements for Stage Lighting

	DRAMATIC STAGES	SMALL STAGES
Equipment Classifications	For "legitimate" and professional "little theatres," average school and college stages — General lighting subordinated to highlighting and local lighting.	Small school and church stages, used infrequently — A simple though flexible plan is desirable with a fixed arrangement so that equipment will always be properly replaced.
	32-40 Circuits — 3 colors.	16 Circuits — 3 colors.
First Borderlight (Acting Area)	100–200-watt, 8"–10" diam. polished or semi-mat reflectors — Gelatine or glass color media — Straw, surprise pink and steel blue — 7 ft. shorter than arch opening as close to arch as possible.	100–200-watt 6"–8" diam. semi-mat reflectors — Gelatine color media — Straw, surprise pink, steel blue — 3 ft. shorter than arch — One borderlight.
Other Borderlights (Scenic Area)	100–200-watt, 8"–10" diam. polished or semi-mat reflectors — Glass or gelatine color media — Red, green and blue — 4 ft. shorter than arch opening — 2 or more border lights depending upon stage depth.	Not generally used unless stage is deep.
Footlights	60–100-watt 4½"–5" diam. single or double row semi-mat reflectors — Gelatine or glass color media — Rose, blue, and white — 4 ft. shorter than arch.	40–60-watt 4"–5" diam. single row semi-mat reflectors — Gelatine color media — 4 ft. shorter than arch.
Cyclorama Floodlights	8–14 500 watt 12" diam. semi-mat reflectors — 2–3 circuits — Gelatine color media.	4–8 300–500-watt 12" diam. semi-mat reflectors — 2 circuits — Gelatine color media.
Balcony or Beam Spotlights	500-watt elliptical spotlights with 6" lenses — 2–4 units per circuit — 6–12 total.	500-watt elliptical spotlights with 6" lenses — 2–3 units per circuit — 4–9 units total.
Overhead Spotlights	8–12 500- or 1000-watt various types — 4–6 circuits.	4–6 400–500-watt lens or reflector spotlights.
Tormentor Spotlights	500-watt elliptical spotlights — 3–6 per side — 3 circuits — 6–12 total.	4 400–500-watt elliptical or lens spotlights — 2 circuits.

UMI

Rewiring the NEWSPLANT

Some ideas gleaned from a Canadian newspaper plant job—Eighth in a series of wiring check lists



CRAMPED QUARTERS *for maintenance, as at this 150 hp. press drive, calls for careful routing of wiring to provide maximum accessibility and safety to workers.*

CONTROL TECHNIQUE *makes multiple presses the major wiring job in the newspaper plant. Intricate circuits require exacting installation to prevent failures and maintenance delays.*

WHEN fire gutted a building occupied by the Vancouver Sun Publishing Company, new quarters were established in a 17 story building that was erected 25 years ago. This building had to be re-wired to provide facilities for modern newspaper equipment, which with the offices of the newspaper, occupy the lower eight floors.

This work was done by Hume E. Rumble, Ltd., one of the largest electrical contracting organizations in Western Canada. More than 10,000 ft. of conduit up to 3½ in. and about 50,000 ft. of wire and cable ranging in size to 750,000 c.m. were used. The various kinds of equipment that were installed in this plant, and the provisions made for their supply and control, are mentioned as a guide to contractors who may be called in to check up on newspaper plant alterations.

To prepare this old building for its new use, necessitated doubling the capacity of the transformer station equipment to operate press motors and auxiliary drives, the building's elevators, and other power loads on upper floors. A number of tenants on the upper floors are commercial printers. These load requirements, together with complete modernization of lighting on eight floors called for new circuits, larger feeders and modern distribution equipment.

To advertise the paper's new home, the summit of the 17 story building was topped with a dazzling reproduction of the Sun. The building's tower also was floodlighted and large neon signs were installed, all of which required a 200 amp. feeder.

Some unusual features and safeguards were provided to make this newsplant secure against outages and to provide safety to machines and their operators. For instance, two 2300-volt primary service cables supply the building. Double-throw disconnect switches allow either cable to be used, while the other cable serves as a standby. Pressroom wiring was laid in floor trenches employing checker plate covers flush with the floor. These trenches extend from the press motor pits direct to power distribution centers. The removable trench covers make all these conductors readily accessible for future maintenance and inspection.

In the new arrangement of feeders, all lighting, stereo metal heating units, and certain motors are operated from three 150 kva. 120/208 volt transformers. These feeders are distributed from a new switchboard that is supplied by three 400,000 c.m., 4-conductor cables from the transformer room. Two new a.c. motored presses and other larger motors are operated at 440 volts from three 150 kva. power transformers. Three 750,000 c.m. secondary cables extend from these power transformers to the 440-volt feeder distribution. Two old presses which were brought in from their former location are operated by 600-volt d.c. motors. This required a separate service which consists of two 750,000 c.m. cables.

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ADEQUATE POWER *provision must anticipate important peak schedules. Here separate transformer banks supply 440-volt motors and the 120/208-volt system for lighting and smaller motors.*

AUTOMATIC SWITCHBOARDS *respond to control impulses from scattered stations and safety or limit devices. None but the best of materials and work will make such system trouble-proof.*

The controls employed for various presses required an elaborate system of wiring between controller panels and remote button stations. The new 5-unit presses have 17 button stations and two emergency stations each. The drive units for each press have a full automatic contactor type controller for taking care of slow starting, and automatic speeding up under desired operating combinations. Coupled with these controls are devices to detect breaks in the paper web, to stop the presses, and clear the cylinders of tangling paper.

There are many intricate electrical details involved in re-wiring a newspaper plant. Much of this detail is highly specialized, and is usually developed by factory experts who are responsible for the press equipment that is being used. The contractor's job is to understand the feeder and distribution requirements for operating the motor and electrically heated equipment at maximum efficiency. The actual installation also requires extreme care in attaching equipment, conduits and fittings for proper clearances, accessibility for maintenance, and to prevent loosening under conditions of vibration. The choice of high grade materials is vital, as damage from rough handling, ink vapors, oil drippage and excessive temperatures is present in various parts of the newsplant.

Opportunities to provide better general and local illumination will be found in checking over the various plant areas. This is particularly true of the press room. Aside from special controls on larger machine units, check the smaller motor driven equipment such as pumps, fans and compressors, where newer types of control, protection, or remote safety control stations may be needed.

Newspaper plants cannot tolerate delays or shutdowns, because their business is operated on exacting deadlines. So the electrical contractor's attention must focus on those features or ideas that will prevent mishaps or failures in the entire electrical system.

CHECK LIST OF VANCOUVER SUN

MOTORS AND CONTROL

Five Unit Multiple Presses (2)
- 150 hp. main drive motor
- 10 hp. threader or starting motor
- automatic over-running clutch to transfer from 10 hp. to 150 motor
- synchronizing clutch to combine both 150 hp. motors in one drive
- fully automatic controller panels
- resistor cooling fan
- 17 remote control stations per press
- 2 emergency control stations per press
- break detectors for stopping press
- web-cutting bayonets, energized by break detectors
- ½-hp. brake motor
- ½-hp. oil pump
- 2 2-hp. paper conveyors

DEPARTMENT REQUIREMENTS

- Color press—60 hp. main drive, 10 hp. threader
- Telephone directory press—60 hp. main drive, 10 hp. threader, 3 hp. paper hoist, 2 hp. paper conveyor
- Octupule Press—50 hp. main drive, 10 hp. threader, 2 3-hp. paper hoists
- Stereo Department—15 motors, 1 to 5 hp.
- Linotype Department—18 frac-hp. motors
- Fire Protection—25 hp. fire pump motor
- Stereo Department—7-ton melting pot—9 kw., 18 linotype machines, 2 kw. each
- Miscellaneous—Pumps, compressors, heating plant and elevator motors

LIGHTING EQUIPMENT

- General illumination in business office
- Indirect illumination in editorial office
- Hood lighting for composing room
- Indirect fixtures for classified adv. dept.
- General press room and work room lighting
- Local lighting under presses
- Tower floodlighting
- Neon signs on tower

RE-WIRING OPERATIONS

- New primary service cables, duplicated for standby use
- Enlarged transformer vault
- New secondary feeder cables from transformers to distribution centers
- New feeders and branch circuits for lower 8 floors of building
- Press control station circuits
- New wiring for a.c. and d.c. motors
- Signals and alarm systems

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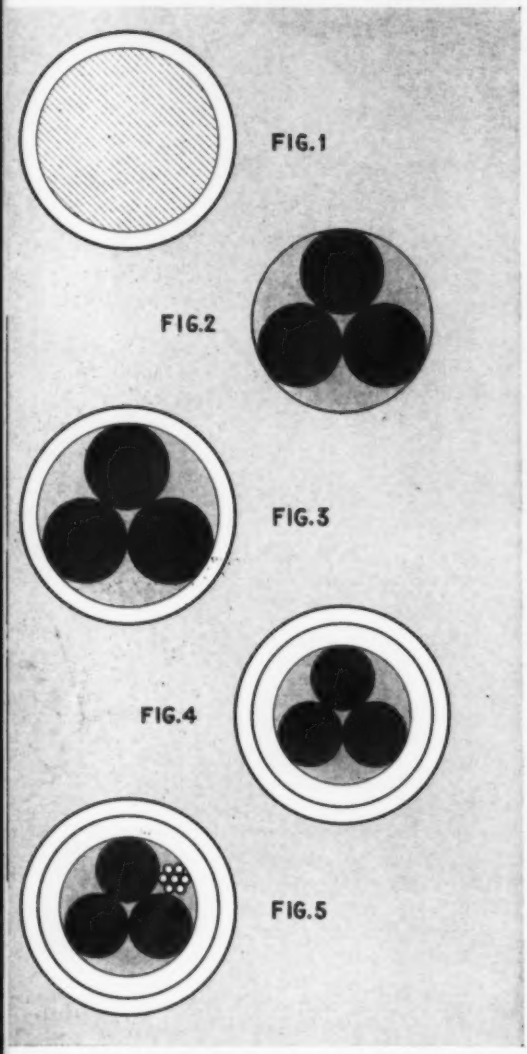
"Geometry of Raceways"



Possibilities for space saving in conduits offered by thin insulation wire and by bare neutral.

CALLING it "the geometry of raceways", the EEI Wiring Committee has prepared this series of pictures to demonstrate the space saving possibilities of thin wall insulation building wire and bare neutral. E. A. Brand, of the Buffalo Niagara and Eastern Power Corporation is chairman. These drawings appear in a booklet on the re-wiring of industrial and commercial buildings. The argument is as follows—

Thin Wall Insulation—The present National Electrical Code limits a ½-inch conduit to not more than four No. 14 or not more than three No. 12 conductors. Since it is common practice to install branch circuits on 115-230 volt, single-phase, a.c. systems, the present Code limits a ½-inch conduit to 3450 watts (115 volts x 15 Amp. x 2 circuits) if No. 14 conductors are used, or to 4600 watts (230 volts x 20 Amp.) if No. 12 conductors are used as one 3-wire circuit. (Fig. 6 and 7).

Thin wall insulation will make it possible to get additional circuit capacities in an existing ½-inch conduit. Three final circuits can be used, each having a rating of 18 amperes, and will produce a total capacity of 6210 watts.

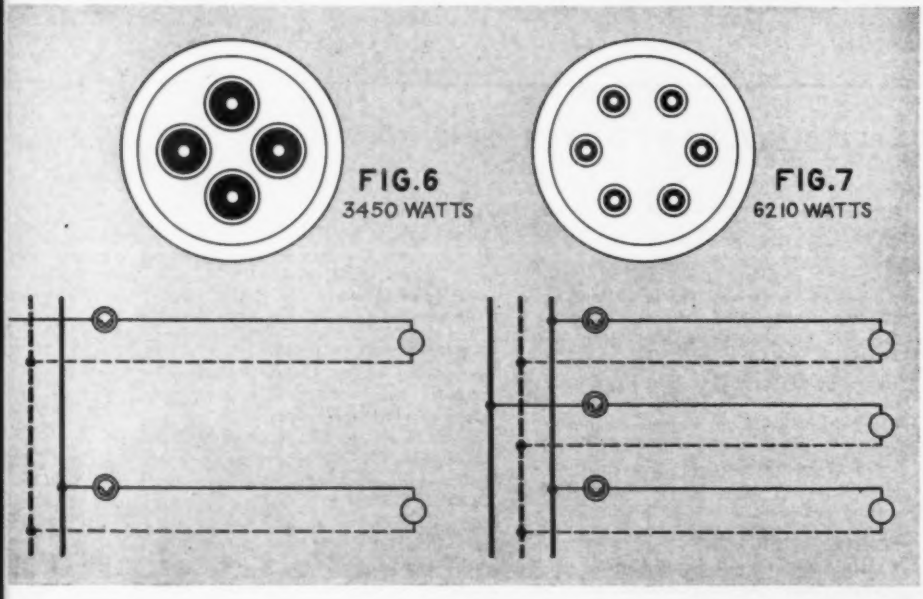
As an alternative, larger copper sizes than before can be installed in the conduit since space is gained by reducing the thickness of the insulation.

Bare Neutral—Code practice has been to limit to 40 per cent the fill of raceways containing more than three conductors. In Figure 1, the shaded portion shows the entire space available in a given size of conduit. In Figure 2, the shaded circle around the three solid circles (which represent three insulated conductors) shows the minimum space required to install these three conductors.

If the shaded circle around the three conductors is equal to the total available space inside the conduit, as shown in Figure 3 the conductors will bind. It will be impossible to install conductors of this size. This is actually a fill of about 65 per cent. The shaded area shown in this figure is dead air space which cannot be utilized for an additional insulated conductor of the same size because it is distributed around the other three conductors.

In Figure 4, the shaded area around the three conductors is smaller than the inside of the conduit and this extra ring of space makes allowance for freedom of pulling, so no damage will be done to the conductors and their insulation.

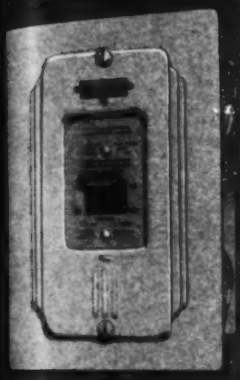
In Figure 5, a fourth uninsulated conductor is included in the shaded circle without increasing its size. This means that a bare neutral can readily be installed along with three insulated conductors to supply a 3-phase, 4-wire system.

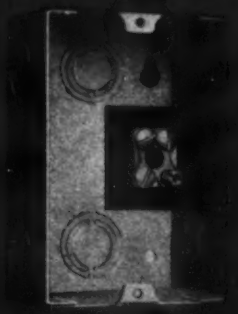


This "geometry of raceways" obviously deals only with considerations of space within a conduit. It is offered as the solution advocated by the power companies for breaking the present barrier to rewiring old commercial and industrial buildings. Here under present Code rules "to increase capacity means replacing conduits at heavy expense because plaster and concrete must be channeled, new conduits installed and wall and ceilings must be replastered or painted and redecorated. As a result only the most necessary modernizing is done. Circuits are overloaded to a point where conditions are unsafe and voltage drops are excessive." And the EEI Committee believes that space saving in conduits is the answer.

The question of whether these recommended measures are safe will be brought before the NFPA Electrical Committee in November. For the electrical contractor's attitude to the eight proposed Code revisions, see page 13.

THE CUTLER-HAMMER MO MULTI-BREAKER





Its low cost, its great convenience, its small size open up a market hitherto untouched!

The outstanding fact about the C-H Cutler-Hammer 25 ampere MO Multi-Breaker is that such small size it packs every operating feature of the larger C-H Multi-Breaker and at half the cost. This triumph is made possible by the smartest kind of styling and engineering . . . in condensing the operating parts into compact size without loss of efficiency, convenience, safety or durability.

In fact, the MO Breaker is rated for any service duty where ordinarily the Type D fused switch would be used. More than that, it is a disconnect switch, circuit breaker and overload protection.

Already thousands of them have been installed in home, farm, REA and other installations, such as oil burners, air conditioning units, refrigeration, feed grinders, pumps, fans and coolers. The list is endless, the market big and virtually untouched.

The MO Breaker is easy to install, easy to wire, and safe. It saves wiring costs because it can be installed at the load center. It pays in every way to feature this great switch. CUTLER-HAMMER, Inc., Pioneer Electrical Manufacturers, 1305 St. Paul Avenue, Milwaukee, Wisconsin.

***LIST PRICE $2.00 up**

Construction Details

1 Two concentric knockouts in sides, back and one end, one in the other end.
2 Case size 5 1/4 x 3 15/16 x 2 7/8.
3 15, 20, 25 Amps.—115-230 Volts A. C.
4 Single pole or double pole.
5 2-wire solid or 3-wire solid grounded or insulated neutral. 2-pole without neutral.
6 Screwless cover for wall mounting.

CUTLER-HAMMER
MULTI-BREAKER
C-H

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Editorials

Earl Whitehorne, Editor

Five Years of "Better Light"

Five years have passed since the Better Light-Better Sight program was launched. It has made a fine contribution to public knowledge of how to use light. Also, as the new lighting season starts, it is particularly gratifying to see the optical industry still active in the campaign, headed by the Better Vision Institute. It proves the sound basis of the program.

This campaign has created a lot of lighting business, a lot of wiring for the electrical industry. It has sold a lot of eye glasses to people who have become alert to the care of their eyes. But the promotion of this intelligent self interest has been founded on a broad public service. And every contractor should tie into it whenever he talks light to any customer.

Send for these EEI Booklets

Credit and thanks are due the Wiring Committee of the Edison Electric Institute for publishing their three booklets. They were issued, one in July and two in August, to promote the Code changes advocated by the power group.

They have made a definite contribution in clearly picturing what covered neutral cable looks like and how thin wall insulation will make room for more copper in conduits. They have diagrammed how a bare neutral will nest in a conduit with three insulated conductors and provide 50 per cent more capacity without increasing the conduit fill.

All this will be interesting to many electrical men. Every contractor should see these books.

The essence of the issue before the industry, however, is not a matter of mechanics. It is a matter of safety. And the safety of bare neutral is not yet generally accepted, because no one seems to satisfactorily explain what will happen if polarity should be reversed and the neutral become a hot wire. Unfortunately the EEI booklets do not take up this point. But until there is a feeling of assurance as to this, the objections to bare neutral will continue.

Full facts on the installations of covered neutral and bare neutral cited but not identified by the power group, should be spread wide before the industry. For men will not take safety on anybody's say so. They must be sure.

So We Play A Small Fiddle

Eddie White, electrical contractor of Newark, N. J., in a letter to the local league bulletin, tells of a recent Newark Housing Project. The electrical contract figured 3.4 per cent of the total job. The plumber got 7.1 and the steam fitter 6.9 per cent. The steam fitter provides heat and hot water. The plumber provides equipment for cleanliness and sanitation. The electrician supplies light, refrigeration, signalling, amusement, safety and also heat, if oil burners are used.

What's wrong? It is not just a matter of selling on that job. The trouble is electrical men are playing a piker part in the building industry of America. They have been content with about one third the volume they should have in all this construction. That's because they have never faced the need for selling America on the full use of electricity.

DON'T MISS IT!

PHILADELPHIA contractors have been working on it since March. They are going to give you a splendid NECA Convention next month.

The meetings will discuss the very problems that you want help on. You will pick up interesting experience that will be usable.

The "Product Exposition" will present the latest developments in the equipment you install. This alone will be worth the trip.

And then there's the World's Fair! Don't miss it. Plan for it now.

On a Grand Scale

A Buffalo low rent, slum-clearance housing project has just bought 1630 electric ranges and 1453 refrigerators. "Nice business for the manufacturers and the power company!" says everybody. But it carries a volume of additional wiring business that should prick up any contractors ears.

The important thing right now is that such installations are demonstrating electric cooking on a grand scale. They are hastening the day when range circuits will swell the electrical percentage on all apartment house jobs. So this development is worth watching.

REA Enters a New Phase

Transfer of the REA into the Department of Agriculture, reporting to Secretary Wallace, starts a new paragraph in the story of rural electrification in America. What changes will come in the policies and practices of REA nobody knows. But there is every reason to expect that the program will go forward.

Under Administrator John Carmody, the farm lines have been vigorously extended. As of July, $226,000,000 have been loaned to carry electricity to some 675,000 farms. The operation involves 225,000 miles of pole lines and 26 generating plants in 44 states. Some 250,000 more farms are already being served, and the number of electrified farms has been doubled in less than five years.

UMI

This is a matter of profound importance to electrical contractors, whether they have so far participated in REA work or not. For here are new customers coming into our market place by the hundreds of thousands. The fact that REA rules and procedures have wrought hardship on some of the men who have built their lines, is a temporary condition. The use of electricity on the farm will be permanent. And some one will do the farmer's wiring and care for his motors.

Sell the Difference

Doc Allison says the way to make people want adequate wiring is to "sell the difference". Say a "bare necessity" job costs $75 and a "full comfort" job costs $115. The cost of adequacy is $40—and cheap enough.

The trouble is most customers have their minds on the $115 as the cost of adequate wiring because the contractor talks that total. The trick is to "Sell the Difference" by playing up the benefits that difference brings. Good sense.

Who Knows But Us?

If people are to enjoy adequate capacity, full voltage, safety and economy in the use of electric service, they need advice. Somebody must see that they have the right size lamps, the proper motors and control and fuses and the right materials in the right places. And the person who advises on this subject must know his business and the customer's. And that's what contractors are for.

Every advertisement and every printed paper sent out by every manufacturer and wholesaler in America, that has to do with electrical equipment, should carry this suggestion—*"Consult your local electrical contractor."* It will cost nothing to add this line, to repeat this thought. But it will save a lot of mistakes, a lot of trouble, a lot of money.

Your Stake in Highway Safety

Highway lighting for safety is making progress—slow but sure. New Jersey is still the shining example, but other states are experimenting and liking it. A national program directed by NEMA is keeping at it.

The New York State Motor Vehicle commissioner now calls speed "Traffic Enemy No. 1" and darkness "Enemy No. 2". The United States Junior Chamber of Commerce is waging a campaign with the slogan "Slow Down at Sun Down". And highway lighting will ultimately save thousands of the lives that lack of it now sacrifices annually.

What part will the electrical contractor play in all this? His family drives the roads. He should be actively behind the program. And if he is, some day he will be busy with the installation and maintenance of the lighting.

Back Talk

These Protection Contracts

To the Editor—"The editorial was a pip. You hit the nail on the head.

"The problem is one of the toughest the industry has and contractors, instead of hindering the manufacturers, should help them. Certainly it would be to their advantage because under the present fraudulent system, no contractor knows whether he is on a par with his competitors or not.

"Your editorial comes at a time when the building wire manufacturers are again starting to make an earnest effort to do away with fraudulent contracts."

W. E. Sprackling, Vice President
Anaconda Wire & Cable Co.

Thanks again, Sprack. It is good news that the manufacturers are going to work on it. If they will properly police the protection contracts they issue, the whole mess can be cleaned up.

Cost of Wiring

To the Editor—"It is our belief that too much thought is being given to the reduction of the cost of wiring. The use of appliances is not held back so much by the cost of wiring as by the cost of operation.

"In our local situation we find the selling of appliances becomes easier as the rates go down. We have a municipal plant with about 5000 meters, and 2000 electric ranges. Our rate begins at 2½ cents. We have an off peak rate of 1 cent for water heating. Practically all new houses and remodeling jobs are wired for electric ranges. I have yet to figure my first job on which the heavy range and service wiring was omitted to reduce the cost of the job. In other words the contractors have done a good selling job on this type of wiring and it is no longer questioned.

"We could look at the plumber and see what a good job he has done in spite of high installation costs. First he sold the idea of a bathroom, then a small wash room, than a second bathroom, then the idea of using all lead pipe instead of iron pipe underground. Also, the plumbing for one bathroom usually runs higher than the total electric job including fixtures, and electric range and refrigerator.

"Our good friends the electric utilities might well ponder on these things and not get so het up about installation costs."

George E. Hollander
F. C. Buerstatte Company
Manitowoc, Wisconsin

We have never believed that present costs of wiring are holding back the size of installations. People are simply not interested in more wiring because we have not yet sold them on its value in terms of comfort and economy. As you say, the plumber has done this and so have the manufacturers of tiles and bathroom equipment.

He's Checked Up

To the Editor—"I have gotten in touch with 50 legitimate contractors in Pennsylvania and do not find one in favor of these drastic code changes. They all seem to be of one opinion that these Code changes are a step backward instead of a step forward, also we are throwing the door wide open to the carpet-bagger and so called handy man.

"Many contractors pointed out that the utility company claiming to have a perfect grounding system sometimes runs into disastrous circumstances when its grounded system fails to do what is expected.

"The Code now only calls for a minimum factor of safety. Unless they change it to increase the safety factor instead of cheapening it, we will find ourselves one of these days without electrical inspections."

J. H. Pfenninger, President
Lancaster County Electrical
Contractors Association
Lancaster, Pa.

We have checked also, as you will see on another page. The contractors are solidly for safety and should be, and they want to play very safe where there is doubt.

Manufacturers to Blame

To the Editor—"Your editorial 'Hercules is Dead' covers a practice that is very much abused. I do not think, however, that it is altogether the fault of the contractor. Some manufacturers in the past have winked at, or condoned, this practice. But I understand that they have lately tried to correct this evil, and with some success.

"I have known of cases where contractors have filed protective contracts on buildings with two or three different manufacturers. In some cases, both manufacturers would ship, only later to find out that their material never went on the job, but was used on another contract or sold to a jobbing house.

"I have been interested directly and indirectly in the conduit business for many years, and, consequently, you appreciate I cannot afford to be quoted. You have taken up an evil that should be corrected, and in order to do so I think the manufacturers have got to do their share of policing the jobs to see that the material is actually used on the job, and that the quantity and sizes are well within the specifications."

An Electrical Manufacturer

This frank statement is good to read. Contractors will rejoice to see an end of fraudulent protection contracts. And any effort the manufacturers make to stop the practice will have their support.

The Old, Old Problem

To the Editor—"I have just read your editorial 'Save The Job!' It is as pertinent today as it was twenty years ago, and it seems remarkable that after all of these years the same problem remains with us.

"The first attempt we made along these lines was at the time Bill Goodwin was going around the country attempting to educate the contractors on proper estimating and accounting methods, more than twenty years ago. We had a large meeting of contractors at which Bill pointed out the evils of inadequate and faulty estimating and accounting, and then showed them how it ought to be done. We furnished all of the contractors with blank forms to be used in this work.

"It is an old, and very important subject which I hope some day will be solved to the everlasting benefit of the public as well as to all branches of the electrical industry."

A Vice President
of a Middle West
Power Company

Shades of the past! Do we remember! But new men come along and make the old mistakes and the need for education never stops.

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He Isn't Loafing—
The Power Is Off

Interrupting Capacity

There Wasn't Enough I C

THIS man wants to work. Yet everything is held up for repairs—all because a protective device, faithful for years, tried to interrupt a short circuit too severe for it to handle. It didn't have sufficient "I C" (Interrupting Capacity) to interrupt the severest short-circuit currents possible on that line. This can happen in any plant where the protective devices do not have the necessary "I C"

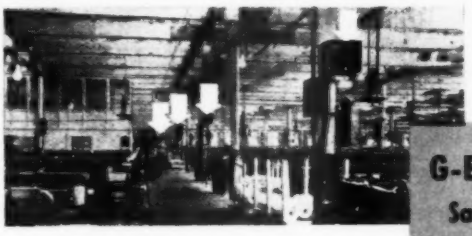
It depends largely on the capacity of the transformers, and it can not be determined by the normal load on the circuit. As plant loads have grown, transformer capacities have been materially increased. Therefore, short circuits present an ever-increasing hazard. They seriously endanger personnel and property wherever the power supply has outgrown the interrupting capacity ("I C") of the protective devices.

Are you sure of your "I C"? With G-E air circuit breakers of known interrupting capacity, you can be sure.

G E N E R A L

There's No Waiting Around

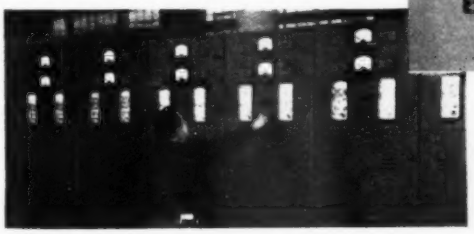
Where G-E Air Circuit Breakers Are Used To Restore Service



Many industrials are demanding air breakers for branch-feeder protection

G-E AIR BREAKERS
Safeguard Employees; Keep Labor and Expensive Machines Productive

G-E air breakers with adjustable trips permit heavy welding currents, but open on dangerous overcurrents



For safety's sake, specify safety-enclosed, factory-assembled air-breaker switchboards for low voltage main feeders

Out with obsolete devices — in with G-E air circuit breakers

E L E C T R I C

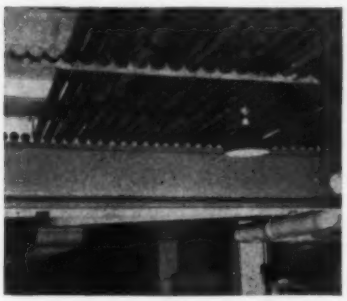
890-88

WIRING Methods

SETTING SLEEVES

Main feeders for a large industrial building in Chicago installed by Henry Newgard & Co., Chicago electrical contractors, pass through a 26 × 26 concrete beam with a rolling fire door below. It was necessary to set sleeves for 42 conduit lines through the beam with unusual precision to avoid offsetting big conduits.

Steel pneumatic tubing ¼ inch thick was used for the sleeves. Blocks of



CAREFUL LAYOUT and lathe turned blocks gave precision line-up to a row of sleeves through a concrete beam.

⅞ wood were turned on a lathe to a drive fit with a hole for ½ rod in the exact center. Conduit runs were then laid out on the beam form and holes drilled for the rods.

The sleeves were then set in place and a ½ rod threaded through and clamped with nuts before reinforcing steel was laid. After the pour the nuts were loosened and the rods and wood blocks removed, leaving the sleeves exactly lined up for the conduits.

KEEPING TAB OF TEMPORARY PERMITS

The granting of temporary service clearances on electrical permits is one of the "headaches" of inspection departments. Once granted, it is usually the inspector's job to follow up temporarily energized installations or systems to get a final inspection of the permanent work.

In Miami Beach, Florida, the electrical inspection department employs a red tag system that simplifies the closing out of temporary permits. When a service is cleared to the power company for temporary energization a red tag is placed on the service switch. Two stubs bearing the identity of the job are removed from the tag. One of these stubs is sent to the power company, and the other is retained on file as a check against the temporary clearance that was issued.

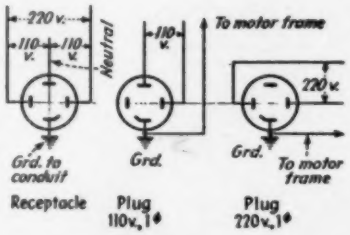
DOUBLE VOLTAGE RECEPTACLE

During the rewiring of an industrial plant, a local contractor wanted to furnish a receptacle which would give the customer both 110 and 220 volts single phase grounded current at each outlet. Here's how he did it.

He used a three phase, 4 wire grounded 220 volt receptacle with a four prong plug. An ordinary 110/220 volt single phase, 3 wire circuit was run to the outlet. The ground prong of the receptacle was grounded to the receptacle cover and thence through the conduit system. The neutral wire of the system was connected to the prong opposite the metallic ground prong. The two outside legs of the circuit were connected to the other two prongs.

Thus, between the neutral and either outside leg 110 volt single phase current could be obtained. 220 volt single phase current could be obtained from the two outer prongs. The fourth prong remains as the metallic ground for either voltage.

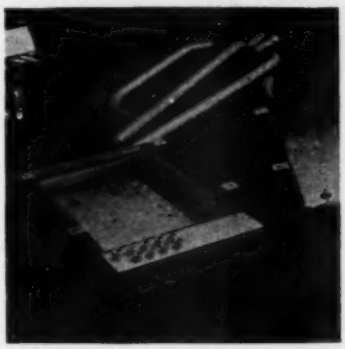
Extreme care had to be exercised in connecting the portable equipment to the four prong plugs. The grounded prong is connected to the frame of the equipment. Either of the other three prongs could be used to obtain 110 or 220 volt single phase current as shown by the accompanying diagram. The installation was made with the permission of the local inspection authorities.



TWO VOLTAGES *can be obtained by this hook up from one four wire grounded receptacle, so that either 110 volt or 220 volt single phase equipment can be operated.*

CONDUIT PRE-BENDING

Rush schedules on the installation of the Comiskey Field floodlighting job in Chicago demanded that every step in the wiring work be planned in advance. Henry Newgard & Co., Chicago, elec-



PRE-BENT AND CUT *conduit and welded-in panel connectors speeded up floodlighting tower wiring.*

trical contractors, prepared most of the tower wiring conduit runs during the erection of the towers.

Six typical towers permitted branch runs and feeder runs from the junction boxes below to be cut and bent from detail sketches. The tower panelboards had threadless connectors welded into a front plate. From the pipe shop set up in the basement of the grand-stand, the appropriate material was distributed to each tower ready for installation.

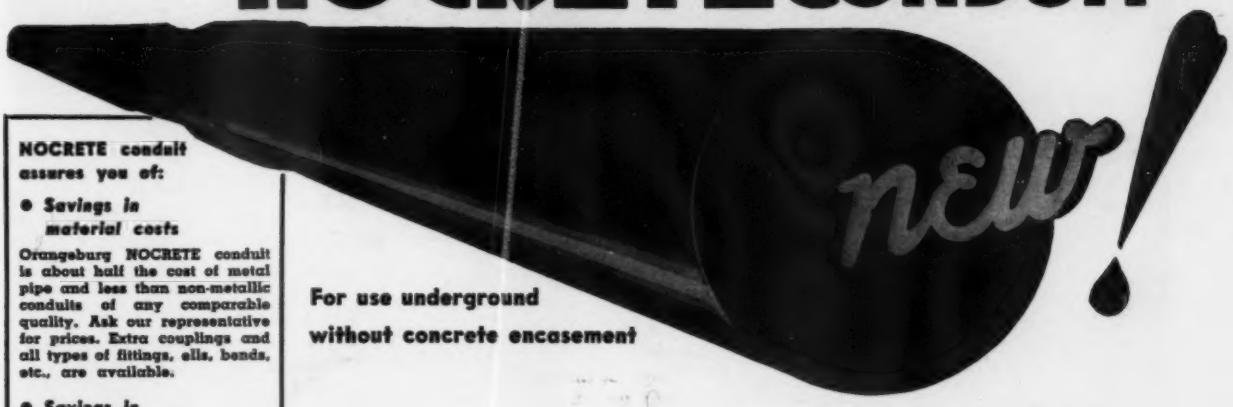
FISHING WIRE THROUGH CONDUITS

Two Philadelphia contractors save time and money on large jobs by using unique methods to fish wire through conduits.

The W. V. Pangborne Co., uses celluloid balls with a cord attached to each one. These balls are blown through the conduits by an electric blower

There's a profit in every foot

ORANGEBURG NOCRETE *the new Dual Economy* CONDUIT



For use underground without concrete encasement

NOCRETE conduit assures you of:

- ***Savings in material costs***

Orangeburg NOCRETE conduit is about half the cost of metal pipe and less than non-metallic conduits of any comparable quality. Ask our representative for prices. Extra couplings and all types of fittings, ells, bends, etc., are available.

- ***Savings in installation costs***

It "handles easy"; light in weight, in handy 5 or 8 foot lengths (in various sizes) this super-sturdy duct will surprise you by its adaptability. It assembles and installs easier, faster and at a lower cost than any conduit you have ever used. It is readily cut and fitted with ordinary woodworking tools.

Approved by Underwriters' Laboratories, Inc. for installation underground (without concrete encasement) — Guide Card 60-014 File E 2557

You'll make added profits on every job when you install NOCRETE in place of the older kinds of conduit.

For instance, when you use NOCRETE you don't need to thread a cut length—instead, just taper the end with jack knife, spoke shave or portable tooling lathe.

The Harrington Joint Coupling (taper sleeve) assembles, by using only a block and mallet.

Think what that means on even the *smallest job*—say a job using fifty feet of conduit underground:

No setting up of heavy vise.
No setting up of heavy dies.

The whole job done quickly, with the simplest of tools.* And that spells *profits.

THE FIBRE CONDUIT COMPANY
Sales Office: 292 Madison Ave., New York
***Factory:* Orangeburg, N. Y.**

Sales Agent—Distributors:
General Electric Supply Corp.
The Graybar Electric Co.

ORANGEBURG

Faries Lamps

FOR EVERY LIGHTING NEED SINCE 1880

Introducing

The COPY-HOLDER LAMP

A new, exclusive item that finds ready acceptance in any office. It combines a highly efficient stenographer's desk lamp with a copy or notebook holder placed at the correct reading angle and perfectly illuminated by restful, glareless light. Prevents eye strain and fatigue—helps the stenographer turn out more and better work. Made in 4 models. Offers exceptional sales possibilities.

NATIONAL ADVERTISING HELPS YOU SELL THE FARIES LINE

There's a lamp for every portable lighting requirement in office, store, or factory. For 59 years, Faries Lamps have been leaders in style and lighting efficiency—your assurance that they'll make good with your customers. The Faries name on a lamp has come to mean something. Advertising in such magazines as Time, Business Week, Forbes, Banking—publications regularly reaching well over a million executives in all lines of business—men whose preferences influence the purchase of lighting equipment. The Faries line is complete—and kept strictly up to date.

Get this CATALOG—It shows 200 Models

A complete, fully illustrated reference to lamps for every requirement—from the President's office to the shipping clerk's desk, the factory, or the showroom. Send for the Faries catalog—use it to sell more lamps.

FARIES MFG. CO.

1004 E. Grand Ave. Decatur, Ill.

S. ROBERT SCHWARTZ DIV.

No. 2242 Guardsman

No. 2213 Guardsman

No. 1561 Executive

No. 1983 Natural Light

No. 2297 Guardsman

No. 2231 Indirect Desk Lamp

No. 141 Adjust. Bracket

Brass Flexible Arm

No. 27 Parabola Shade

No. 10-900 Bench Light

No. 41 Bench Light

WIRING Methods

[FROM PAGE 26]

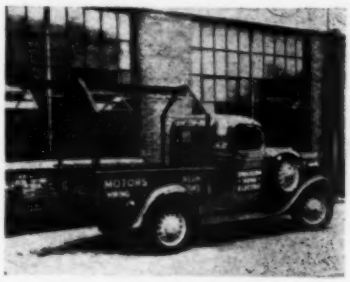
equipped with a nozzle. The fish tape, attached to the cord, is then pulled through by hand.

The H. P. Foley Company employs the same principle by using a parachute arrangement. The four ends of a handkerchief are tied to a cord in parachute fashion. This parachute, blown through the conduit by compressed air, pulls the cord through and swabs the conduit in the same operation. The fish tape attached to the cord can then be pulled through by hand.

TRUCK HOIST

Trucks of the Swanson-Nunn Electric Company of Evansville, Ind., carry a counterpart of the same hoisting facilities that are used in the shop.

Frames at the front and rear of the truck body support an I-beam projecting three feet beyond the rear of the truck. A chain hoist rolls along the beam. With this equipment the loading and unloading of heavy equipment from the truck is a one man job.



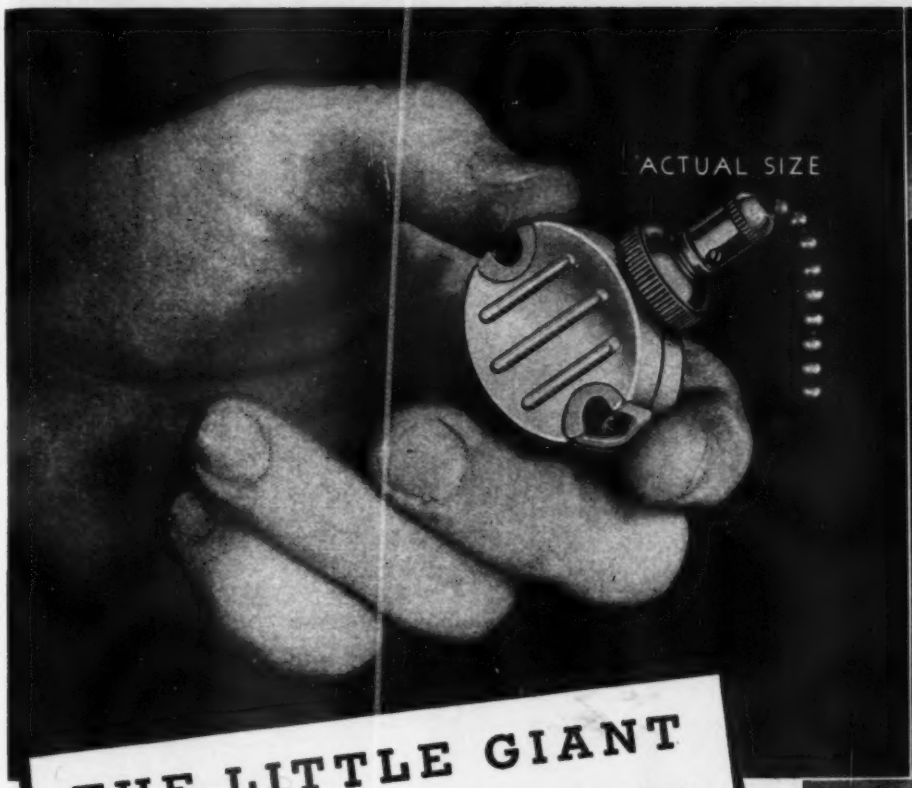
SMART TRUCKS—*Bright colors plus an efficient loading hoist makes these trucks a strong combination of utility and attractiveness.*

The trucks are conspicuously painted in brilliant red, blue, and yellow enamels and have a lot of advertising value, as they roll through the streets of Evansville.

SPARE CABLES FOR TESTING

While connecting the staff registers and various units of a large doctor's paging system in a Louisiana hospital job, the contractor used the spare cables for portable telephones. This permitted talking directly between stations and eliminated "ringing out" thousands of connections.

UMI



THE LITTLE GIANT NOW MIGHTIER THAN EVER

McGILL *Levolier*

The Smallest* 6-Amp. Switch NOW Has a "T" Rating

The biggest little switch on the market! Same price . . . same size, but now the thin model Levolier Switch No. 41 is listed by the Underwriters' Laboratories under the "T" rating — (6 Amps., "T," 125 Volts; or 3 Amps., 250 Volts). This sturdy little switch actually will take the initial surge of 48 Amps. from a cold, Type "C" lamp, eight times its rated capacity.

Used on small power apparatus and for individual control of lighting fixtures in industrial plants, commercial institutions and public buildings, the original No. 41 switch already has established an enviable record for efficient, economical service. Now, with further improvements in the switch mechanism, a sturdy switch has been made even more rugged. Order from your jobber now! His stock is complete.

Switches No. 39, 42 and 43 also are listed under the "T" rating. Nos. 42 and 43 differ from the No. 41 switch in stem length only. No. 39 switch is equipped with link for use with chain fixtures.

*Only 5/8" thick.

McGILL MANUFACTURING COMPANY
Box No. 670, VALPARAISO, INDIANA

UMI

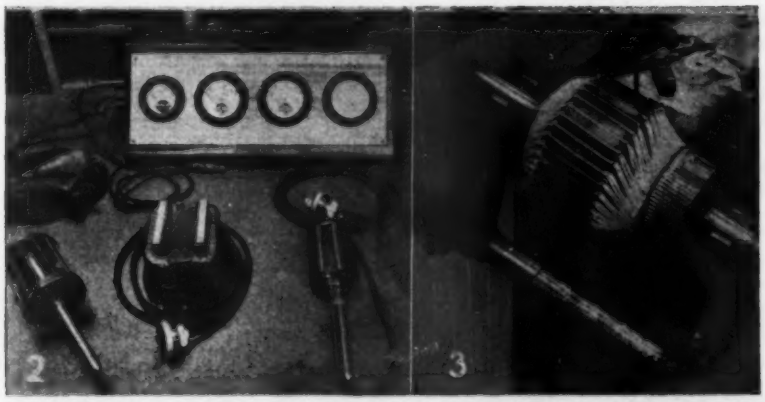
Motor Shops

FOR SMALL REPAIR WORK

A compact bench for testing, repairing and rewinding of small motors is used by Backstrand Bros. Electric Works, Riverside Calif. This bench is made up in the shape of the letter "U" with drawers on each side, shelves with repair parts and stock at the rear, and electric outlets conveniently available. Several interesting and novel facilities to do the work are introduced.

Underneath the bench is a spool of magnet wire accessible to the winder. At the end of the bench is a sliding support to hold an armature while rewinding it. The construction of the sliding support accommodates the various sizes of armatures to be repaired.

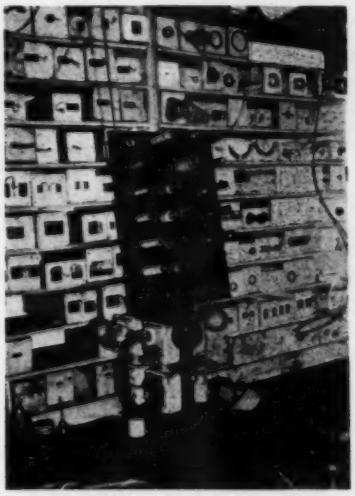
On the bench itself are a number of convenient instruments for making tests. They are mounted in a slanting panel on a box from which leads are provided to be attached to the motors or equipment under test. In the foreground are two "growlers"—one to test short-circuited armatures, the other to be inserted inside the stator for testing. The little squirrel-cage arrangement is used to test the completely rewound stator. It revolves in the electric field smoothly, if the job is done correctly.



THREE SHOP ECONOMIES—1. Step saving is readily apparent with this U-shaped bench arrangement which provides drawers on three sides, all within easy reach. 2. Testing facilities especially adapted to small jobs. The bevelled instrument panel has flexible test leads, and handy connections are provided nearby for small growlers. 3. Effort reduced by handy armature support adds to workman's efficiency. This sliding yoke rack adjusts easily to take various armature sizes.

BEARING CHECKER

For quickly checking bearing and washer sizes without resorting to calipers, mechanics at the Swanson-Nunn Electric Co. motor shop in Evansville, Ind., have a board with 22 projecting standard shafts from ⅛ to 1¼ diameter 4 inches long.



CHECKER *for doubtful bearings and washers quickly spots size and extent of wear.*

Bearings or washers of doubtful size are slipped onto the best fitting shaft, white numbers on a black background indicate the size of each shaft.

POT FOR SOLDERING COMMUTATORS

This bench-type pot is used by the Johnson Electric Company of Staunton, Va., for quickly soldering commutators. The soldering pot was cast at a local foundry and measures 7 inches in diameter and 2 inches deep. For quick heating it is necessary that the burner under this pot have a gas consumption of 10,000 BTU's per hour.

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EQUIPMENT LISTED BY UNDERWRITERS' LABORATORIES, INC.

CurtiStrip

Fluorescent

Our new, complete Fluorescent Catalog, just off the press, will gladly be sent to you

18 pages full of valuable Fluorescent lighting information—

Please write for this Serial 1025

Fluorescent CurtiStrip is "finished" . . . accurately engineered . . . correctly designed for easy, profitable wiring. Contractors will find in this Curtis line the right Fluorescent equipment for both their commercial and industrial installations.

Curtis Lighting

1123 W. JACKSON BLVD.

NEW YORK CHICAGO TORONTO

Reach out for NEW business with Wiremold

Modern Service Station Lighting with Wiremold Fluorescent

NEW business opportunities like these . . .

Rewiring
School Buildings
Office Buildings
Stores
Show Windows
Counters
Wall Cases
Hotels
Clubs
Restaurants
Factory Buildings
Homes
Prefabricated Houses

Outlet Systems
Beauty Parlors
Floor Lamp Displays
Table Lamp Displays
Portable Fans
Water Coolers

Overfloor Outlets
Telephone
Office Machines

Fluorescent Lamp Lighting
Bank Teller's Cage
Wall Cases
Inspection Tables
Assembly Benches
Color Matching
Etc., etc.

Become Lighting
HEADQUARTERS
for Your Territory . . .

at a time when better lighting is your best business building opportunity

OUTSTANDING Wiremold developments in the field of lighting offer Wiremold Contractors an exceptional opportunity to assume leadership in the very definite UPSWING in lighting business now evident throughout the country.

Wiremold has consistently lead in the development of needed NEW Better Wiring Systems and equipment . . . to meet the demands of this trend.

Wiremold Flourescent Strip, Fittings and Reflectors have already established new standards of convenience and efficiency in installing Fluorescent lighting.

NEW Wiremold Showcase Strip for Fluorescent and Lumiline lamps; Wiremold Show Window Lighting Systems and the broadened application of other Wiremold Wiring Systems such as "Pancake" and Plugmold in connection with lighting modernization for homes, stores, offices, commercial buildings and schools . . . all of these give Wiremold Contractors and utility lighting departments an unrivaled set-up for correct solution of present day better lighting problems.

Use Wiremold Engineering and Data Sheet Service Freely

All the resources of the Wiremold Company, including experienced lighting engineering assistance, are placed at your disposal to aid you in building profitable new lighting business NOW. Use these Services freely.

ADEQUATE WIRING SERVES AND SAVES

WIREMOLD
Your BUSINESS BUILDER

THE WIREMOLD COMPANY HARTFORD CONN

Motor Shops

[FROM PAGE 30]

In use, the armature shaft is rested on one side of pot, in which a notch has been ground. The armature is lowered so that segments of commutator rest about ¼ inch in solder, and is slowly

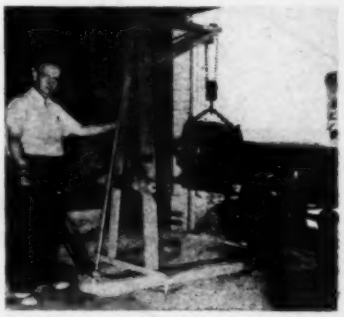
QUICK SOLDERING—*Gas-fired pot for revolving commutator edge in molten solder.*

revolved. Should larger armatures be soldered, a sling can be made to carry the weight of armature. Godwin G. Johnson claims that Boyer's soldering paste No. 31 gives best results.

SMALL SHOP CRANE

Overhead trolley systems and electric chain hoist are common enough around the bigger shops. But they are hard to justify economically in the smaller establishments where big motor jobs are rare.

C. D. Moore of the C. D. Moore Electric Company in Lexington, Kentucky, has found a small hand operated,



HANDY HOIST *for the small shop simplifies handling the occasional big motor job.*

one-half ton capacity rolling hoist, an economical and back saving solution to the problem. It handles the occasional big motor that comes through the shop. It provides sufficient lift to clear the motor off the bench and load it on a truck.

UMI

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Great Names Will Welcome You!

TO PHILADELPHIA IN OCTOBER

Historic Philadelphia, hub of a great industrial empire, is the home of many manufacturers of electric products that are known throughout the nation. These manufacturers join in inviting NECA delegates to Philadelphia in October.

NECA CONVENTION

OCT. 9-12 • PHILADELPHIA

These manufacturers, who extend a special word of welcome, have presented their products on the pages following:

- SKF Industries, Inc.
- T. B. Woods Sons Co.
- Partrick & Wilkins Co.
- Philadelphia Electric Co.
- Reflectors, Inc.
- Bellevue - Stratford Hotel
- George Sachsenmaier Co.
- Crescent Insulated Wire & Cable Co.
- Okonite Co.

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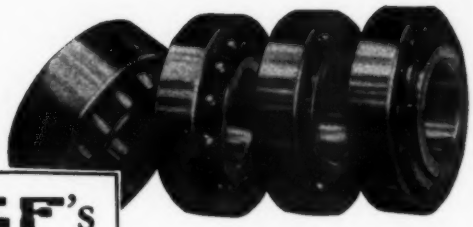
Build *good will* with SKF's



Progressive motor service shop and industrial maintenance experts know that tough motor loads depend for year-'round, low-maintenance service on ball and roller bearings.

They know, too, that long experience in the shop and in the plant proves SKF Ball and Roller Bearings to be products of great precision . . . made to an exacting formula with infinite care.

Write for SKF literature that will tell you how to make friends and reduce maintenance costs through the proper selection and care of ball and roller bearings.

SKF Industries, Inc., Front St. & Erie Ave., Philadelphia, Pa.

4444

SKF BALL AND ROLLER BEARINGS

Check these advantages of SKF bearings:
Better motor performance
No spillage or splattering of lubricants
Freedom from dirt and grit
Greater uniformity of air gap
Lubrication economies
Less frequent lubrication and inspection
Bearing wear minimized
Fewer motor outages from bearing faults
COME TO HISTORIC PHILADELPHIA
Birthplace of ELECTRICAL PROGRESS
NECA CONVENTION · 1939
SKF Ball and Roller Bearings are available for all types of rotating electrical machinery—industrial motors, especially of the explosion-proof, totally enclosed, dust-proof and splash-proof types — synchronous motors — vertical motors — motor generators — alternators and generators—electric drills and other portable tools—small motors used in industrial and domestic equipment and appliances.

1857—the first WOOD'S factory

82 Years Ago

OUR ADVERTISING READ:

"We offer you

QUALITY

of the highest character—

PRICES

lowest possible

consistent with Quality—

SERVICE

courteous, prompt."

Established 1857

NOTE: Some desirable, protected territory still open for alert distributors who want to cash in on the WOOD'S Quality Line. Ask for Plan.

Wood's EVERYTHING IN TRANSMISSION: Bearings—Collars—Clutches—Couplings—Contactors—Hangers—Pillow Blocks—Pulleys—V-Belt Sheaves and Complete Drives.

"From miniature to mammoth in Power Transmission Machinery"

TODAY Our policies remain unchanged and WOOD'S Power Transmission Products still represent the *best buy* in the field—measured both by inherent worth and actual performance. And, because of the knowledge gained by long years of practical experience and the high standards we set more than three score and ten years ago your plant can be operated more economically—your product can be made more profitably.

1939—WOOD'S large, well equipped plant

T. B. WOOD'S SONS COMPANY • CHAMBERSBURG, PENNSYLVANIA

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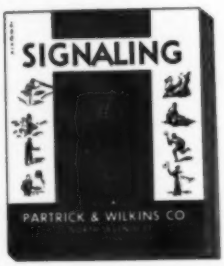
PIONEERS

Will Greet You!



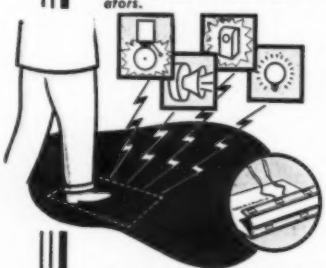
In Philadelphia, home of electrical development, is located the Partrick & Wilkins plant. For over 73 years this company has contributed to the advancement of electricity, working with such men as Thomas Edison and Alexander Graham Bell. This company participated in the development and manufacture of the first phonograph, motion picture machine, and carbon transmitter—all of which were milestones in the industry's progress.

Today, still pioneering in modern signaling equipment, Partrick & Wilkins joins in welcoming NECA members to historic Philadelphia.

The new #2600 "Guarantee" flush automatic reset annunciators.

P & W Annunciators . . .
Automatic Reset

No hand resetting. Fully automatic. Pay for themselves in long life and more efficient service. The P & W line of annunciators is complete, for every application. Write for new 1939 "Signaling" catalog.



May be conveniently installed to operate 110 volt signals or lights if a relay having 110 volt contacts is interposed in the low voltage circuit for this purpose.

Partrick & Wilkins electric matting provides a foolproof and unfailing method of detecting. A normal pressure or footstep on Partrick & Wilkins matting immediately causes an electric contact, which in turn can be used to ring a low voltage bell, sound a buzzer, light a low voltage electric signaling bulb, or give other visual or audible electric signal.

Partrick & Wilkins electric matting is furnished in rolls 2 feet wide by 10 feet long. Any length may be easily cut from this roll.

WRITE FOR NEW CATALOG

SINCE 1867

PARTRICK & WILKINS CO.

51 NORTH SEVENTH ST.

PHILADELPHIA, PENNSYLVANIA

Just published!

INDUSTRIAL BUYING of ELECTRICAL PRODUCTS *In 4 Key Cities*

A 36-page book presenting data developed from complete studies of industrial buying of electrical products in four large cities, located in key buying centers

Sent Without Charge to

MANUFACTURERS ONLY

Write

MARKET RESEARCH DEPT.

Electrical Contracting

330 W. 42 ST., NEW YORK

Howdy!

THIS IS A BIG MOMENT IN MY LIFE!

"Yes, sir! It isn't often I can welcome to Philadelphia electrical contractors from all over the country. Because you are in the clan, so to speak—working tooth and nail to give bigger and better electrical service—this occasion is a big moment in my life!"

So enthuses Ready Kilowatt, the busiest fellow in Philadelphia. And when we say busy, we mean just that! For, he serves 575,000 homes . . . average annual consumption more than 1000 kw. hrs. In commercial and industrial establishments, despite discouraging business conditions, his kilowatt-hour load has increased 34% over the past five years. And besides all this, about 25% of Ready Kilowatt's total electric output keeps transportation systems in this territory moving (50% increase since 1933). Just a workin' fool . . . and glad of it!

PHILADELPHIA ELECTRIC COMPANY

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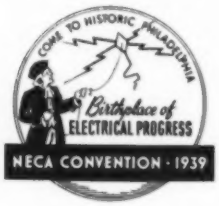
Welcome to

INDUSTRIAL SPECIALISTS



Fair dealing for 35 years in all types of high grade electrical machinery has resulted in establishing our name among industrial men. The Sachsenmaier plant is unusual for its modern facilities to render quick service. It is one of the industry's outstanding sources of supply for new and rebuilt stocks comprising

THOUSANDS OF INDUSTRIAL MOTORS
TURBO GENERATORS
MOTOR GENERATORS
ENGINE GENERATORS
LARGE MOTORS
TRANSFORMERS
CONDENSERS
SWITCH GEAR AND CONTROLS

NECA visitors are cordially invited to visit our plant. Telephone us at Mayfair 2900 for transportation. You will see:

1—Heavy machine bay—60' wide and 208' long, with its 25-ton electric crane.

2—Small apparatus bays—two wings 28' wide and 208' long with electric cranes, where thousands of smaller types of apparatus are displayed.

3—Storage yard for condensers, transformers and other weatherproof equipment, served by a Gantry crane.

Industrial contractors, factory executives, and wholesales, write us about your apparatus needs or what you have for sale.

GEORGE SACHSENMAIER CO.

Power Plant Equipment
Generators—Motors
8427 Hegerman St., Holmesburg,
PHILADELPHIA, PA.

OCTOBER

Convention Issue Electrical Contracting

Copies distributed to all attending the N. E. C. A. Convention

Extra value for manufacturers!

ELECTRICAL CONTRACTING

330 W. 42 St., New York

socially, commercially, politically, is the Bellevue. Here vital things happen, outstanding events are held — and important people stay. Reasonable rates always.

HEADQUARTERS
NATIONAL ELECTRICAL CONTRACTORS ASSOCIATION
October 9—10—11

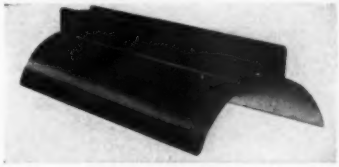
★

When you lunch, dine or stay at the BELLEVUE, you see the real PHILADELPHIA, a combination of traditional hospitality and the progressive spirit of the day.

"BELLEVUE" STRATFORD
IN PHILADELPHIA
Claude H. Bennett, General Manager

★

Ideal Reflectors for FLUORESCENT LIGHTING



Copyright and Patent Pending

Reflecto-Duct

The last word in auxiliary equipment for fluorescent lighting. An enameled steel reflector, attractive in appearance, lasting in service, easy to install and offering a profitable margin to contractors and jobbers.

It is made of heavy-gauge steel, spot welded. Exterior finish is antique bronze; white porcelain-like finish inside. Slots are provided for sockets. Removable cover, fastened by two screws, has holes to fasten and bolt the auxiliary, as well as holes near the ends of the cover for insertion of male loops. May be suspended by wire or chain.

MADE FOR 48"—36"—24"—18" FLUORESCENT LAMPS

ONE AND TWO TUBE MODELS

SINGLE LAMP UNITS

Model	List Price	Size
SER 18....	$5.50	5⅞ x 10½ x 22
SER 24....	6.00	5⅞ x 10½ x 28
SER 36....	7.00	5⅞ x 10½ x 40
SER 48....	12.00	6 x 10½ x 52

DOUBLE LAMP UNITS

Model	List Price	Size
DER 18....	$7.50	5⅞ x 12¼ x 22
DER 24....	8.50	5⅞ x 12¼ x 28
DER 36....	9.50	5⅞ x 12¼ x 40
DER 48....	15.00	6 x 12¼ x 52

SOLD UNWIRED, WITHOUT AUXILIARIES OR SOCKETS

Any special finish such as Chrome, Aluminum, etc., can be supplied at extra cost.

PACKED IN INDIVIDUAL CARTONS F.O.B. PHILADELPHIA, PENNA.

Underwriters' Recommendations on Wiring Accompany Each Unit

REFLECTORS, INC.

3225 Frankford Ave. Philadelphia

RUBBER COVERED POWER CABLES • BUILDING WIRE

VARNISHED CAMBRIC • FLEXIBLE CORDS • LEAD ENCASED AND PARKWAY CABLES • ARMORED CABLE

CRESFLEX NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE CABLE • MAGNET WIRE • BARE WIRE

CRESCENT

Portable Cords and Cables are made for jobs like these . . . .

CRESCENT IMPERIAL Portable Cords and Cables are made, in a complete line, to take punishment and deliver current to all equipment from the smallest hand tools to mammoth electric shovels. They are non-kinking, have high tensile strength and are resistant to water, acids and alkalis. These cables, also, have a dense, smooth, wear resisting sheath of tire-tread toughness to provide maximum life under severe service conditions.

Above is shown CRESCENT Neoprene Jacketed IMPERIAL Portable Cable which provides high resistance to oil, grease, excessive heat and sunlight.

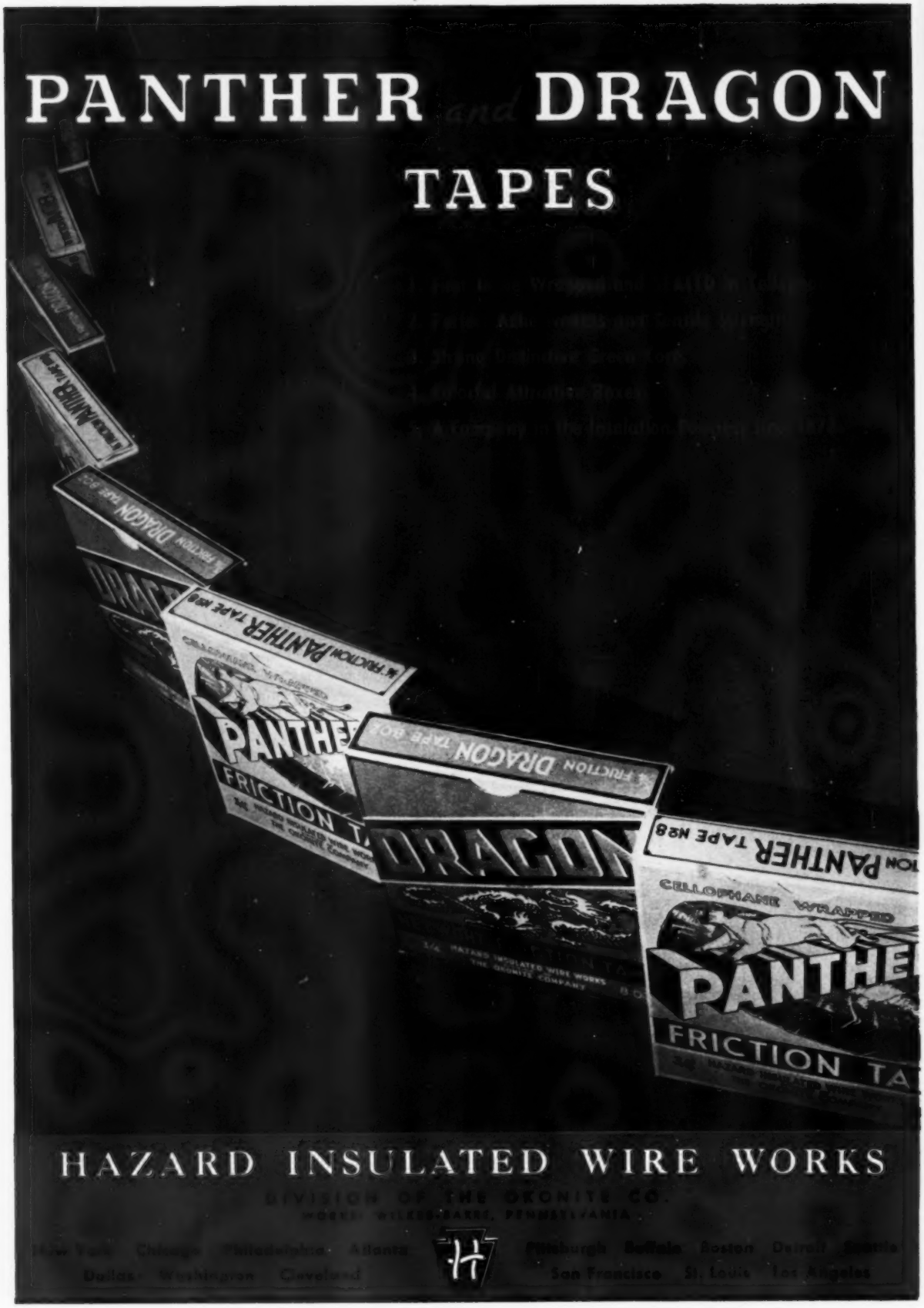
Send for Descriptive Bulletin

CRESCENT INSULATED WIRE & CABLE CO. INC

TRENTON, NEW JERSEY

Atlanta Baltimore Boston Buffalo Chicago Cincinnati Cleveland
Detroit Indianapolis Kansas City Los Angeles Minneapolis
New Orleans New York Philadelphia Pittsburgh St. Louis San Francisco

CRESCENT ENDURITE SUPER · AGING INSULATION

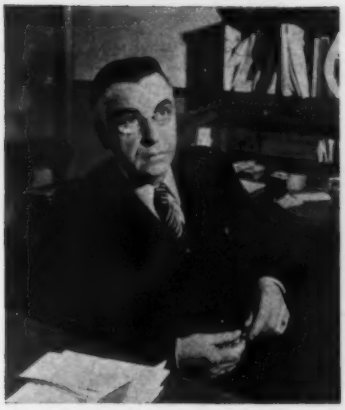

PANTHER and DRAGON
TAPES
PANTHER TAPE NO 8
FRICTION TAPE
DRAGON
CELLOPHANE WRAPPED
FRICTION TA
HAZARD INSULATED WIRE WORKS
DIVISION OF THE OKONITE CO.
WORKS: WILKES-BARRE, PENNSYLVANIA
New York Chicago Philadelphia Atlanta Pittsburgh Buffalo Boston Detroit Seattle
Dallas Washington Cleveland San Francisco St. Louis Los Angeles

Questions ON THE Code

Answered by

F. N. M. SQUIRES

Chief Inspector New York Board of Fire Underwriters



HOTELS MODERNIZING—Bernard B. Whelan, Boston's Superintendent of Wires since October 26, reports that hotel reinspections resulted in the rewiring of four older establishments. With 22 years of service in the inspection department, Mr. Whelan recognizes the value of continuous reinspection work. So two inspectors work at it exclusively, while 18 others assigned to interior wiring devote one day per week to checking up old systems.

Service Switch

Q. *"We are using a main 60 amp. entrance switch with solid mains, fuses for the range side and four 15 amp. fuses for the four branches to be served. What is wrong with such a switch? This particular switch is No. 8490 made by the Corcoran Brown Lamp Division of the Electric Auto-Light Company of Cincinnati, Ohio."*—A.L.V.A.

A. This switch is listed by Underwriters' Laboratories as a 60 amp. 125–250 V. service switch and, therefore, may be used as a service entrance switch on a 3 wire single phase 125–250 volt service to serve a range and four lighting branch circuits, provided the computed load on each side does not exceed 60 amperes. We know of nothing wrong with this switch.

A Grounding Problem

Q. A. *"Am I correct that this layout answers for all interior grounding and the only grounding that is required, and that grounding interior conduit and armored cable elsewhere is not correct and a Code violation?*

B. *"Is this a Code violation? In your opinion, if these interior grounds are placed, can any serious results occur? Would it be proper and in order if an Inspector should ask for them?"*

—W.J.S.

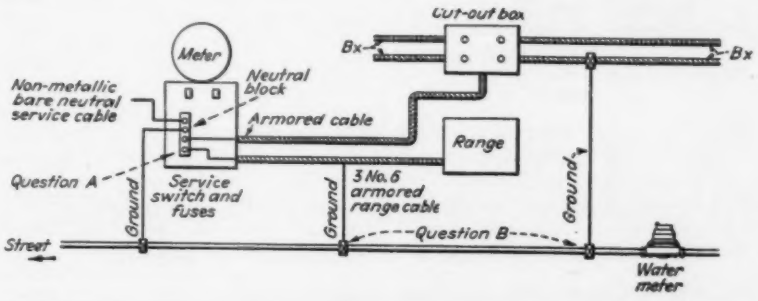
A. A. Section 2595 permits the grounding conductor of an interior wiring system, to be also used as the grounding conductor for equipment, conduit, etc. provided that it is of sufficient carrying capacity to satisfy Section 2596f and provided that the secondary system has at least one other ground.

B. The Code does not forbid the use of independent grounding conductors shown in question B, provided they are all as near as practicable to the service; unless such an arrangement would result in the objectionable flow of current over the grounding conductors, the probability of which is quite remote.

For the location of points of attachment see Section 2601 a & b, and about the objectionable current, see Section 2531.

Outdoor Meter Condition

Q. *"Where one uses outdoor socket meters, there are times when it is advantageous to run the wires back from the meter through the same conduit which contains the service wires. Is this permissible according to Code? Does the absence of switch or fuses alter the fact?"*—A. C. B.



A. If the conduit is of the proper size for the number and size of the wires which it contains, from the Code standpoint, there is no objection to running the wires to and from the meter in the same conduit. The location of service switch and fuses does not alter this fact.

Splices for K. & T. Work

Q. *"I noticed in the 1937 National Electrical Code book a statement reading 'All splices must be accessible.' I would like some information referring to that statement and how it would apply to knob and tubing wiring systems. If this statement means that splices and taps must be made in boxes so that they can be reached, it will eliminate the biggest advantage of knob and tube wiring."*—E.R.S.

A. It is not the intent of the Code to require that all splices in a knob and tube job be accessible. Section 3008 covers splices, in general, as to how they shall be made and insulated, but says nothing about accessibility.

Section 3014 requires that a box be installed at each outlet, switch, or junction point of conduit, electric metallic tubing, surface metal raceway, armored cable or non-metallic sheathed cable (note that knob and tube wiring is not

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Questions on the Code

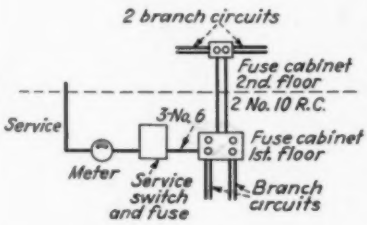
[FROM PAGE 41]

included) and that a box is required at each outlet and switch point of concealed knob and tube work.

And now note in the foregoing that the requirement for a box at each *junction* point of knob and tube work, is omitted. Therefore tap splices on a knob and tube job need not be in boxes.

Fusing Sub Feeders

Q. *"In the accompanying illustration is it necessary to fuse the two No. 10 subfeeders at the head of the feeders?"*—A.C.B.



A. With the conditions as shown, having a sub feed of two No. 10 supplying two fuses for branch circuits on the second floor, the two No. 10's would have to be fused at the fuse cabinet on the first floor. But if they terminated on the second floor in a single 25 amp. fuse from whence they would supply the two 15 amp. fuses, for the two branch circuits (see section 2434d) this would not be necessary.

A Service Problem

Q. *"Using the diagram on Page 10 of "Know your Code" as an illustration, we have here as the service equipment, a sequence box to house the meter.*

"I would like to know how far you can go from this point to the service switch and fuse, also, does this run have to be in conduit for the entire distance?

In other words, how far can you go with an unfused wire or wires, into a building? Three wire 110–220 volts is used mostly."—H.M.K.

A. The diagram referred to above was reprinted from a diagram in J. M. Turnbull's article "Know Your Code" which was published in the September, 1937 issue of this paper. This is a typical schematic wiring layout and our correspondent refers to the service portion of the sketch. The meter was omitted from this diagram inasmuch as the meter is not a part of the service equipment which is required by the Code.

The meter may be installed ahead of the service equipment (protective and disconnecting means), provided (according to Section 2375e) that the supply is alternating current of not over 300 volts between wires and the wires between meter and service equipment are installed as separate conductors in approved cables, rigid conduit or electric metallic tubing. The service switch should be placed at a readily accessible point nearest to the entrance of the conductors as required by Section 2351a. Inspectors feel that there should not be more than three feet of unfused wires within a building.

Our correspondent mentions grounding in the meter box. This does not seem to be prohibited by the Code, as Section 2533 merely requires that the grounding connection for an a.c. service should be on the supply side of the service equipment. However, if the meter box is sealed and, therefore, is inaccessible to the Inspector, he will require that it be in an accessible location in which case the most logical place is in the service switch box.

Service in Concrete Wall

Q. *"I am about to wire a building of fireproof construction which is all of concrete. I want to run a 1½-in. service conduit down inside of the concrete wall from the weatherhead to a 90 deg. elbow at the first floor and then run the conduit about 14 feet and then drop down with another 90 deg. elbow into the main service switch. This 14 feet is to run in the concrete floor of the first floor which is also of concrete.*

"I cannot put the main entrance switch on the outside wall on account of a furnace and a chimney. Please let me know if I am allowed to put my service conduit in the concrete floor of the building?"— W.A.H.

A. The second sentence of Section 2303 states that conductors in conduit placed under at least two inches of concrete beneath a building or buried in two inches of concrete within a wall, shall be considered outside the building.

In this case, therefore, the service conduit being buried with two inches of concrete all around it, where it runs down in the concrete wall, and then continues with two inches of concrete all around it in the concrete floor, can be considered as being outside the building up to the point where the conduit emerges from the concrete at the main service switch. So this installation complies with the Code.

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Estimating

STAGE EQUIPMENT

A school auditorium with a 40 foot proscenium provided the following labor cost data on the installation of lighting equipment. Daily time reports were made of the work on the exit lights, border, stage pockets, stage floodlights and disappearing footlights.

The exit signs were installed in 12x8 inch boxes previously set during roughing in. The border strip was hung on a pipe batten suspended from ceiling inserts and connected to a pull box through a flexible cable.

The stage pockets and footlights were set in the wood stage floor by carpenters, the time shown includes this work. The floodlights were set flush in the suspended ceiling which was accessible from above.

No time is included for superintending or layout. Handling from the storeroom and unpacking are included in the time shown.

14 flush exit signs
total time, 12 m.h.
average time .85 m.h. each.

35 ft. border strip
total time 29 m.h.

2 2-gang stage pockets
total time 9.50 m.h.
average time 4.75 m.h. each.

3 Flood lights with spill rings
total time 8 m.h.
average time 2.66 m.h. each

7 5-ft. sections foot lights
total time 40 m.h.
average time 5.71 m.h. per section.

NURSE'S CALL SYSTEM

An installation of additional stations and equipment on the nurse's call system of an eastern hospital required unusual caution and cooperation with the hospital staff. The rooms in the sections affected were occupied by patients, many seriously ill.

Before work could be started in any room, the mechanic called a nurse who checked on the patients condition to be certain that the disturbance would not affect him. This procedure slowed up the work considerably.

The job included the equipment shown on the accompanying list. As conduit and wiring were installed under normal conditions, they are not listed. No allowance is included for supervision or testing.

The units most affected by delay were the bedside stations. The figures for the other types of stations are not significantly different from average labor units.

Equipment installed
50 bedside stations
40 corridor dome signals
11 utility room signals
4 nurse's station signals
4 interconnection cabinets

Bedside stations
Total time 37 m.h.
average time .78 m.h. each

Dome signals
total time 15 m.h.
average time .38 m.h. each

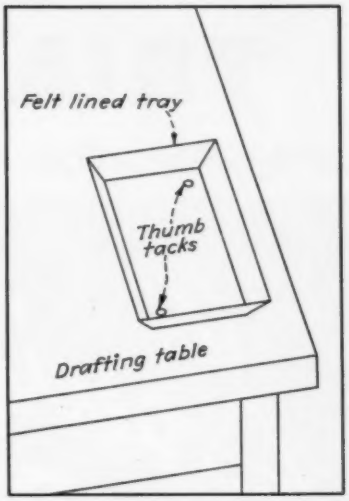
Utility room signals and nurse's stations
total time 8 m.h.
average time .53 m.h. each

Interconnection cabinets
Total time 8 m.h.
average time 2 m.h. each.

CLARE SMALLCOMB *is the new president of the Los Angeles Electrical Estimators Club, which now meets each Thursday noon. This organization, established in 1926, discusses codes and ordinances, hears talks on wiring materials and equipment, stages picnics and social meetings for good fellowship. Smallcomb was a charter member and specializes in ventilation.*

FOR YOUR SMALL TOOLS

To keep the rotometer, tally-meter and colored pencils handy and to protect them from being accidentally swept off the drafting table, use a shallow metal tray. A refrigerator ice-tray is ideal. Line it with felt, punch a couple of holes in the bottom and attach it to the lower right-hand corner of the drafting table with thumb tacks. Tacked down, the tray will not slide off on the floor or tip, yet it is easily removed and stored away in a desk drawer when not needed.



***FELT-LINED** tray thumb-tacked to the drafting table keeps instruments and pencils from rolling on the floor.*

PRINTING PRESS CONTROL

In a large lithographing plant, a small press was removed to make space for a two-color press with automatic feeder. The electrical work required moving the old controller, pulling in a new feeder circuit of three No. 8 conductors in the old conduit, mounting the new controller and control stations, installing a 10 h.p. motor on the press and a 2 h.p. motor and control for the automatic feeder.

Final connections were made after regular working hours. The rest of the job was handled without interrupting the plant routine.

The motor was a 10 h.p. slipring type. The controller included definite time acceleration and remote pre-set speed control. Eight push button stations, located on the press as shown in the accompanying diagram, operated the press motor. One start-stop and a safe button operated the automatic feeder motor.

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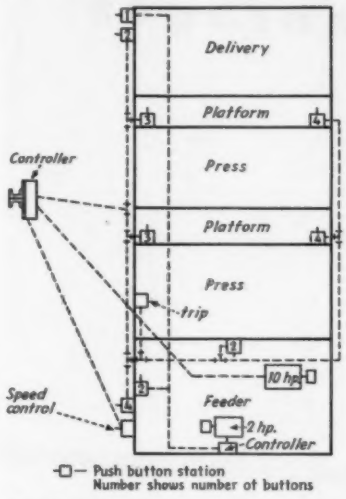
The push button stations were mounted on ¼ x 1 inch flat iron brackets formed on the job and secured by ¼ inch machine screws tapped to the press frame. The control wiring used was No. 16 solid wire. Each run was carefully tagged as it was pulled assuring correct connections and elimi-



PRESS CONTROL—*Diagram of layout on which these time estimates are based.*

nating ringing out the conductors. All circuits were tested for insulation resistance with a megger.

Two mechanics handled the job in a total of 110 man-hours. Detail on the time and material was as follows:

Distribution of time

Removing and storing old controller	4 m.h.
Removing old wiring	3 m.h.
Layout	13 m.h.
Hang controller and stations	22 m.h.
Conduit work	32 m.h.
Wire (including new feeder)	10 m.h.
Connecting	18 m.h.
Set motor (10 h.p.)	2 m.h.
Paint and test	6 m.h.
	110 m.h.

Materials used

2	1 button stations
3	2 button stations
2	3 button stations
3	4 button stations
1	Preset speed control
1	controller
2	1¼" flex fittings
2	1" flex fittings
3	feet 1¼" flex
3	feet 1" flex
15	feet 1¼" conduit
15	feet 1" conduit
40	feet ¾" conduit
450'	# 16 SBRC code wire
120'	# 14 SBRC code wire
350'	# 8 SBRC stranded
	misc. straps, locknuts, etc.

This data covering material and man hours consumed on this job were listed by this contractor for guidance on future jobs of a similar nature.

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Nowhere else a fixture like this—the simplest detachable reflector ever made—and the only one which gives you these two important advantages:

1. ***Metal-to-glass connection between hood and reflector; cannot corrode or stick.***
2. ***The socket is easily removed without tools; reflector may be immersed for thorough cleaning.***

GOODRICH DISKONECT REFLECTORS

To attach, simply lift the plunger; reflector and lamp are removed as a unit. When you press reflector back into the hood, the spring-set plunger snaps solidly into place, locks securely. One hood accommodates both medium and Mogul sockets. Reflectors, finished in permanent porcelain enamel, are offered in a variety of styles. An exclusive Goodrich product.

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Available in 300-500 watt and 750-1000 watt sizes, this Westinghouse GB Luminaire employs the new Hi-Flec Glass for better lighting.

1 Neutral Ivory Color when Lighted;

2 Blending of Basin and Ceiling Brightness;

3 Basin Weight 20 per cent Lighter;

4 High Lighting Efficiency.

High intensity, glareless illumination is created by this Magnalux Luminaire with Hi-Flec Glass in 200, 300, 500, 750 and 1000 watt sizes.

NEW BEAUTY... NEW EFFICIENCY

Advancing still another step in improved design and efficiency, Westinghouse Commercial Lighting units are now equipped with the new Hi-Flec Glass — the latest development in Conditioned Lighting. Because this new glass provides a psychologically cooler light — its color is neutral ivory when lighted — and because it harmonizes with all architectural interiors, Magnalux and GB Luminaire applications are practically unlimited. This new glass assures a surface brightness which blends with ceiling brightness . . . and it sets new standards for high intensity, glareless, shadowless, properly distributed illumination.

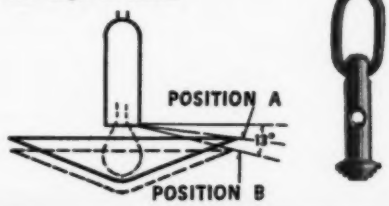
A wide range of luminaire styles is available in Magnalux with screw-base lamps and a variety of basin designs and hanger types. The GB is designed to utilize effectively the characteristic spread of illumination from the Bipost lamp. You will find both units ideally suited for offices, libraries, public buildings and schools.

NEW LIGHT CUTOFF CONTROL

The new Variable Light Cutoff is an exclusive feature. Clevis pins of two-hole construction are provided for attachment to the basin support rods. By installing the support rods through the upper hole in the pin the angle of cutoff is increased. For a lesser angle of cutoff the lower hole may be used. Write Westinghouse Electric & Mfg. Co., Lighting Division, Edgewater Park, Cleveland, Ohio.

Position A shows the unit supported from lower hole clevis pin. Clevis Pin at right.

Position B shows unit supported from upper hole for 5 degree greater angle of cutoff.



Westinghouse Lighting Equipment

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Maintenance

FACTS BEHIND THE MAN

MORE waste is caused in the world by neglect of maintenance than by wars, insects, rodents or drought. You build something and next day it begins its long slow process of deterioration. You put something together and at once vibration, atmospheric corrosion, temperature changes and use begin, little by little, to pull it apart.

Modern industrial management realizes this and so there is a maintenance crew in every factory. But that is only the first step. The crew must be organized. It must be equipped with tools. It must know what to do. And there again a second kind of maintenance is needed—maintenance of knowledge, information, data, experience.

This series of Maintenance Guide Sheets is presenting month by month a background review of the more important elements of the electrical system in the care of the modern maintenance man. For it is not what you have known, it's what you remember and the facts you can put a quick finger on in an emergency that counts.

This series of articles began in January, 1938, with a frank review of the electrical maintenance man's job. Then came—

1. Alternating Current Motors—Types and Applications
2. Direct Current Motors—Types and Applications
3. Alternating Current Motors—Maintenance
4. Direct Current Motors—Maintenance
5. A.C. Motor Starters and Controllers—Types and Applications
6. D.C. Motor Starters and Controllers—Types and Applications
7. Maintenance of Control Equipment
8. Special Control Problems—Heavy Installations and Maintenance
9. Electric Distribution
10. Lighting
11. Electric Heat
12. Electric Welding
13. Interplant Communication
14. Instruments
15. Power Tools
16. Batteries and Rectifiers
17. Electroplating
18. Electronic Devices
19. Circuit Breakers
20. Equipment for Hazardous Locations (this issue)

Coming articles will discuss

21. Transformers
22. Wiring Devices and Cables
23. Drives
24. Elevators, Conveyors, Cranes and Trucks
25. Ventilating and Air Conditioning Equipment
26. Management of Maintenance

Equipment For Hazardous Locations

Applications and Maintenance

BEING familiar with the various operations and processes in his plant, every electrical maintenance man knows where to guard against hazardous conditions. For such locations, approved electrical apparatus and devices are available, providing the precise design and construction that the Code requires for safeguarding life and equipment.

It is not enough, however, to use explosion proof fittings in these dangerous areas. They must be properly selected and installed and then maintained in good operating condition. This matter of explosion proof equipment, therefore, becomes a serious concern to the electrical maintenance man, and calls for considerable background knowledge.

Classification of Hazards

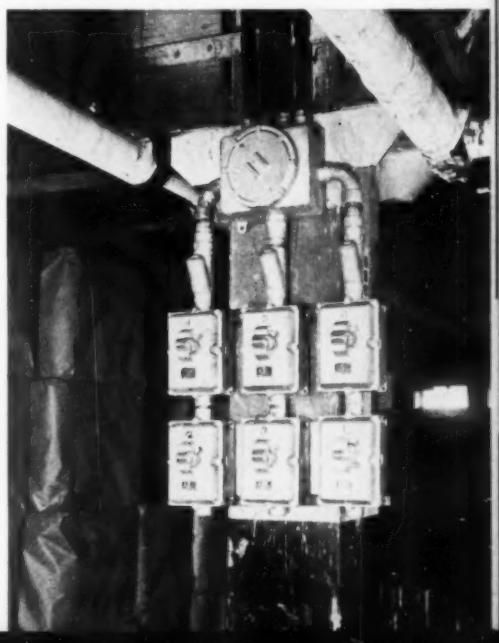
Explosion-proofing, used here as a collective term, is not a recent development. In 1922, committees were formed to determine how to prevent fires caused by dust and gas explosions. By 1925 a definite code was adopted for equipment. In 1933 an approved set of regulations were included in the National Electrical Code and since then much experimenting has been carried on, and the use of explosion-proof and dust-tight equipment for hazardous locations has received world-wide attention.

One of the chief contributions of this committee's work was the thorough classification of the various hazardous industries. Four divisions were formulated—

Class I is probably the most important and covers the greater portion of the hazardous field today. It includes practically all flammable volatile liquids, highly flammable mixtures or other highly flammable substances. It embraces processes in industries too numerous to list.

One of the most important of them is oil refining with all by-products.

FOR SAFETY *in a Class I Group D location. Six explosion-proof motor starters grouped to make a power panel, with junction box at top, for paint mixing tanks at Standard Paint and Varnish Works, Chicago. (Appleton Electric Co. photo.)*



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PAINT SPRAY BOOTHS *come under Class I Group D. Lighting fixture and switches, explosion-proof types, are used at Maas and Waldstein Co., Chicago. (Appleton Electric Co. photo.)*

And the action of gasoline, in forming flammable vapor-air mixtures, is quite typical of many volatile liquids. Gasoline has a rich mixture at a 1.25 percent concentration of vapor in air by volume.

Class II hazardous locations are, in general, those where combustible dust is thrown into suspension in the air in sufficient quantities to produce explosive mixtures. It also includes conditions where it is impracticable to prevent combustible dust from collecting on or in motors, lamps or other electrical devices that are likely to become overheated because normal radiation is prevented.

Action of explosive dusts parallels very closely that of explosive vapors. The percentage of combustible dust in suspension in air within certain limits, creates the same hazards as flammable vapors and produces explosions of even greater violence.

Class III and IV hazardous locations, although closely connected to Class II, have a distinction in that they involve easily ignitable fibers that when in suspension in air ignite with lightning-like rapidity. Such fires, usually caused by cotton or hemp fibers, totally destroy their surroundings in relatively short time. Class III covers locations where ignitable fibers, or materials producing combustible flyings, are handled, manufactured or used. Class IV covers locations where the same kind of materials are stored.

Selection and Application

Classifications given in the 1937 National Electrical Code, Article 500, list most of the common industries in the United States, where compliance with the regulations is obligatory. The first step in the selection of equipment is to study that list and definitely determine which class of hazard is involved. Where industries are listed under all four classes, it is necessary to study the processes involved and analyze the conditions encountered, in selecting equipment for any hazardous location.

When a new process is considered, particularly if it is not listed—selection of equipment should be made with caution. It is well here, to consult and cooperate with the fire insurance inspectors and their engineers. They have extensive experience in this field.

Safe equipment is listed by Underwriters' Laboratories, Inc. Their offices are located at 161 Sixth Ave., New York; 207 East Ohio St., Chicago; 500 Sansome St., San Francisco. All equipment is approved for certain classes and groups. Explosion-proof equipment cannot be used where dust-tight equipment is required, unless the device is so specified. Equipment such as motors, breakers, panelboards, fittings are under the label service by Underwriters' Laboratories, and are well marked. Most manufacturers list clearly the classes and groups for which they have attained approval.

Most explosion-proof and dust-tight apparatus is manufactured under Class I, Group D, and Class II, Group G, approvals. Petroleum and grain industries have been the greatest users of this equipment. At the present time, only limited equipment is available for Groups B and C, and none for Group A.

For locations where atmosphere contains the gases and dusts of Groups A, B, C, E and F, all electrical apparatus and fittings should be installed outside the hazardous locations, except where equipment has been developed for such areas. Lighting must be handled by floodlights placed outside, with the light shining through surrounding windows.

All motors, generators, controllers, relays, thermal cut-outs, resistors, or any devices likely to arc or spark must be of an approved type for use in the class of hazard encountered. Where conditions permit, motors, controllers, and contactors may better be mounted outside the hazardous area, with remote control pushbuttons of approved type mounted within at convenient points. The only alternative is the use of the more expensive explosion-proof equipment suitable for the conditions.

Service equipment such as panelboards and switchboards also should be placed, outside of the hazardous area, if possible. However, where branch-lighting or light-duty switching control is desired within the hazardous area, units of an approved explosion-proof style must be used. Units may be obtained for 4 to 16 branch circuits, having single- and double-pole no-fuse circuit breakers.

Sealing is necessary in Class I locations in order to prevent spread of explosive pressures from one enclosure to another. It is required at all points in the conduit system where conduit terminates in an enclosure housing an electrical device of an arcing nature. Also, sealing is required before and after all switches, whether of make-and-break or momentary contact types. The latest development along this line is the type of fitting which is supplied complete with the electrical device sealed in.

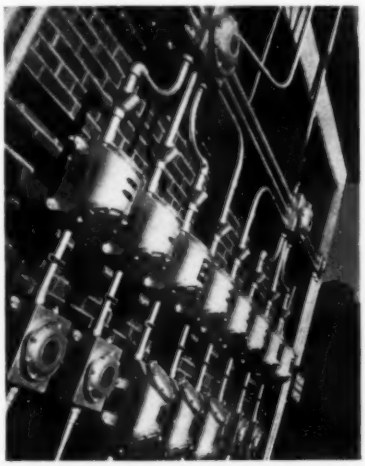
However, sealing is not required at the conduit terminal of a fitting for a plug receptacle. The receptacle has a seal and open pigtails for splicing to line wires. The same condition holds true on lighting fixtures and most motors.

Outlet and junction boxes must be of a type approved for Class I locations. No sealing of junction fittings is required at conduit terminals unless a sparking device is housed within.

Plugs and receptacles for Class I locations are of varied design. The interlocking type is one style approved for light-duty work. Another type uses the principle of delayed time in withdrawing the plug.

Grounding in hazardous locations is important as circuits must be opened immediately at times of abnormal current. These conditions give rise to temperature which is always a factor in explosive atmospheres.

Where type "S" rubber-covered cord is permitted for portable explosion-



AT THE BULK PLANT *of the Socony Vacuum Oil Co., Hartford, Conn., magnetic starters and circuit breakers require Class I Group D enclosures, and are mounted on building exterior. (Trumbull Elec. Mfg. Co. photo.)*

MAINTENANCE GUIDE SHEET—APPROVED EQUIPMENT FOR HAZARDOUS LOCATIONS

As shown in List of Inspected Electrical Equipment published by Underwriters' Laboratories, Inc., May 1939.

NOTE — Class I, Groups A and B, and Class II, Group E are omitted as no approved equipment is available at the present time.

EQUIPMENT		CLASS I		CLASS II	
		GROUP C	GROUP D	GROUP F	GROUP G
INDUSTRIAL CONTROL EQUIPMENT	Magnetic Motor Starter	No equipment	Single-, 2-, or 3-Phase 3 to 30 HP. 110–220–440–550 V., A.C.	No equipment	Single-, 2-, or 3-Phase, 1½ to 30 HP. 110–220–440–550 V., A.C.
	Manual Motor Starter	No equipment	¼ to 7½ HP., 230–460–575 V., A.C.	2 to 30 HP., 115–230–460–575 V., A.C.	1½ to 7½ HP., 110–220–440–550 V., A.C.
	Pressure Motor Starter	No equipment	⅓ to 1 HP., 110–220–440–550 V., A.C.	No equipment	No equipment
	Push Button Station, Air-Break	5 to 30 Amp., 230–460–600 V., A.C.	5 Amp. 600 V., A.C.; 15 Amp. 600 V. (non-ind.)	5–10 Amp., 230–460–600 V., A.C.	5 Amp. 600 V., A.C.; 15 Amp. 600 V., A.C. (non-inductive)
	Push Button Station, Oil Type	No equipment	5.3 Amp. 600 V., A.C.	No equipment	0.125 to 10 Amp., 110–220–440–550 V., A.C., 115–230–600 V., D.C.
	Limit Switch	No equipment	2.5 to 10 Amp. 115–230–550 V., A.C.	No equipment	No equipment
MOTORS	Fractional Horsepower	No equipment	550 V. or less, D.C.; 600 V. or less, A.C.	No equipment	230 V. or less, D.C.; 550 V. or less, A.C.
	Integral Horsepower	No equipment	60 HP.-550 V., D.C.; 250 HP.-2300 V., A.C.	No equipment	230 V. or less, D.C.; 100 HP.-2300 V., A.C.
SWITCHES	Motor Circuit and General Use	No equipment	30–60–100 Amp. 250 V., D.C.-575 V., A.C., 2 to 30 HP., 125–575 V., A.C., 125–250 V., D.C.	30-60-100-200 Amp., 125–250 V., D.C., 230–460–575 V., A.C.; 1½ to 50 HP., 115–575 V., A.C., 125–250 V., D.C.	30-60-100-200 Amp., 125–250 V., D.C., 230–460–575 V., A.C.; 1½ to 50 H.P. 115–575 V., A.C., 125–250 V., D.C.
	Snap	Single- and Double-Pole, 3-way, 4-way, 5 to 20 Amp., 125–250 V.	Single- and Double-Pole, 3-way, 4-way, 5 to 20 Amp., 125–250 V.	Single- and Double-Pole, 3-way, 4-way, 5 to 20 Amp., 125–250 V.	Single- and Double-Pole, 3-way, 4-way, 5 to 20 Amp., 125–250 V.
CIRCUIT BREAKERS	Thermal-Operated with Automatic Overload Protection	Single- and Double-Pole, Non-inductive and Fractional Horsepower, A.C. or D.C.	Single- and Double-Pole, Non-inductive and Fractional Horsepower, A.C. or D.C.	Single- and Double-Pole, Non-inductive and Fractional Horsepower, A.C. or D.C.	Single- and Double-Pole, Non-inductive and Fractional Horsepower, A.C. or D.C.
	Air-Break with Automatic Overload Protection	Single- and Double-Pole, 15 to 50 Amp., A.C. or D.C.	Single-, 2-, or 3-Pole, 15 to 225 Amp., A.C. or D.C.	Single-, 2-, or 3-Pole, 15 to 225 Amp., A.C. or D.C.	Single-, 2-, or 3-Pole, 15 to 225 Amp., A.C. or D.C.
OUTLET BOXES AND FITTINGS	Unions, Elbows and Fittings	Conduit Sizes ½ to 3 in.	Conduit Sizes ½ to 3 in.	Conduit Sizes ½ to 3 in.	Conduit Sizes ½ to 3 in.
	Flexible Connections	½ and ¾ in. Sizes. 4 to 36 in. Lengths	½ and ¾ in. Sizes. 4 to 36 in. Lengths	½ and ¾ in. Sizes. 4 to 36 in. Lengths	½ and ¾ in. Sizes. 4 to 36 in. Lengths
	Universal Box, Connector Union	No equipment	½, ¾, and 1 in. Sizes	½, ¾, and 1 in. Sizes	½, ¾, and 1 in. Sizes

EQUIPMENT		CLASS I		CLASS II	
		GROUP C	GROUP D	GROUP F	GROUP G
OUTLET BOXES AND FITTINGS	Sealing Fittings	½ to 3 in. Sizes	½ to 3 in. Sizes	Not necessary	Not necessary
	Junction Boxes	½ to 1¼ in. Sizes. Union or Threaded Hubs. Round or Square Bodies	½ to 4 in. Sizes. Union or Threaded Hubs. Round or Square Bodies	½ to 4 in. Sizes. Union or Threaded Hubs. Round or Square Bodies	½ to 4 in. Sizes. Union or Threaded Hubs. Round or Square Bodies
	Outlet Boxes For "S" Cord	No equipment	¾ and ¾ in. Sizes 3 and 4 wires, 460 V.	No equipment	No equipment
LIGHTING FIXTURES	Pendent Ceiling Bracket	40–50–100–150–200–300 Watts, 250 V.	100–150–200–300–500 Watts, 250 V.	10 Watt, 125 V.	10–60–100–150–200–300–500 Watts, 250 V.
	Portable	40 Watt; 250 V.	40–100 Watts, 250 V.	No equipment	200 Watts, 250 V.
FLASH-LIGHTS & LANTERNS	Flashlight	No equipment	0.35 Amp. at 2.5 V. 0.35 Amp. at 3.8 V.	No equipment	No equipment
	Lantern	No equipment	0.3 Amp. at 5 Volt 0.5 Amp. at 4.8 Volt	No equipment	No equipment
PANEL-BDS	Lighting and Low Capacity Power Distribution	4 to 8 Circuits, Single- and Double-Pole	4 to 16 Circuits, Single- and Double-Pole	4 to 24 Circuits, Single- and Double-Pole	4 to 24 Circuits, Single- and Double-Pole
RECEPTACLES AND PLUGS	Delayed Action	15–30–60 Amp.; 1 to 3 HP., 115–230–460 V., A.C., 60 Cycles	15–30–60 Amp.; 1 to 5 HP., 115–230–460 V., A.C.	No equipment	20 Amp. 250 V., A.C., D.C.; 2 HP., 220–440 V., A.C., 2-wire, 3-pole, 3-wire, 4-pole
	Interlocking	20 Amp., 250 V., A.C. or D.C.; 1 to 2 HP., 250 V., D.C.; 1 HP. 230 V., A.C.	20 Amp., 250 V., A.C. or D.C.; 2 HP., 220–440 V., A.C. 3-wire, 4-pole, 2-wire, 3-pole	No equipment	20 Amp., 250 V., A.C., D.C.; 2 HP., 220–440 V., A.C. 2-wire 3-pole, 3-wire 4-pole
SIGNAL APPLIANCES	Audible	No equipment	10 to 39 Watts, 6, 12, 24, 32, 110, 220 V., 60 Cycles, A.C.; 10–19 Watts, D.C.	No equipment	10 to 39 Watts, 6, 12, 24, 32, 110, 220 V., 60 Cycles, A.C.; 10–19 Watts, D.C.
	Relays	No equipment	0.8 Amp., 110 V. Coil Rating 440 V., A.C., 60 Cycles; 250 V., D.C.	No equipment	0.8 Amp., 110 V. Coil Rating 440 V., A.C., 60 Cycles; 250 V., D.C.
MISCELLANEOUS	Thermostats	No equipment	10 Amp., ½ HP., 110 V., A.C.; 5 Amp., ½ HP., 220 V., A.C.	10 Amp., ½ HP., 110 V., A.C.; 5 Amp., ½ HP., 220 V., A.C.	10 Amp., ½ HP., 110 V., A.C.; 5 Amp., ½ HP., 220 V., A.C.
	Cord Reels	No equipment	15 Amp., 250 V., 2-pole 3-wire, 3-pole 4-wire	No equipment	No equipment
	Solenoids	No equipment	0.58 Amp., 110 V., 0.27 Amp., 220 V., 0.126 Amp., 440 V.	No equipment	No equipment

FURTHER PRECAUTION *at a gasoline plant. Although explosion-proof induction motors are coupled to centrifugal pumps, the pumping units operate outdoors. (General Electric Co. photo.)*

proof equipment, the type having a grounding conductor should be used.

Hand lamps must be equipped with guards, to protect globes from breakage. But an adequate number of ceiling and lighting fixtures are recommended so that the need for portable lamps will be at a minimum. Where hand lamps are used, an automatic take-up reel, equipped with 50 ft. of rubber-covered cord and a maintained ground circuit, is available and approved for use in hazardous locations.

Threaded rigid conduit for the wiring system is the only type approved for use in Class I locations. At least five full threads must be in engagement at every hub and explosion-proof joint. Explosion-proof unions may be employed wherever necessary. Flexible connections, such as used at motor terminals or on portable machines, are permissible providing they are approved for use in Class I locations.

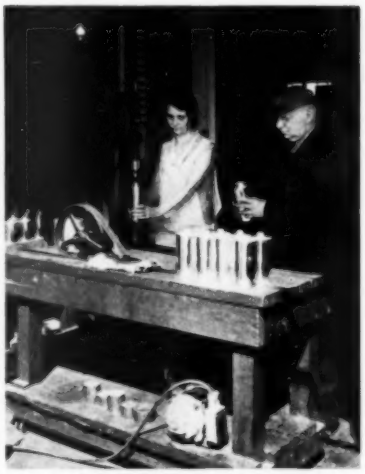
Spray Booths. — In determining whether a location may be hazardous, it should be understood that only sections of a room may be hazardous while the remainder may be non-hazardous. An example is a paint spray booth, which comes under Class I, Group D. No motors, lighting fixtures, or other electrical equipment may be placed within the spray booth or ventilating ducts, nor in any location where paint spray might cover them.

Illumination may be provided by either of the typical flood or mercury types of auxiliary equipment mounted outside the region of flammable vapors. Explosion-proof lighting fixtures should be used behind wire glass panels in the walls of the booth.

Dust Proofing. Equipment for Class II locations is generally of a nature that the enclosure is dust-tight. In addition, when blanketed with quantities of dust, the enclosure, must maintain a temperature below that of the ignition point of the dust. All electrical apparatus and fittings must be of a type approved for use in this class.

Here also, only rigid conduit and threaded connections are allowed. But sealing for arcing and sparking devices is not required. However, manufacturers are required to seal motor terminal boxes in order to prevent the entrance of dust.

Where difficulties arise in obtaining suitable equipment, motors, panels, controllers and similar equipment should be placed outside of the hazardous zone or in a separate room. The room should be built of substantial non-combustible material, and constructed to exclude dust. Also, auxiliary means must be provided to keep the room ventilated and provided with clean air at an even temperature.



CAN CAPPING MACHINE *at Nubian Paint and Varnish Co., Chicago, has only a ¼ hp., 1750 r.p.m., 110 volt, 60 cycle, single phase motor, but the installation requires that the motor be the explosion-proof type. (Century Elec. Co. photo.)*

Care of Equipment

Maintenance of electrical equipment used in hazardous locations is as important after installation as the choice was originally. Inspection and servicing is similar to that required for equipment used in "ordinary" locations. However, as apparatus and fittings are designed and constructed to meet specific conditions and the standards of Underwriters' Laboratories, additional attention is necessary. Special points to be covered are:

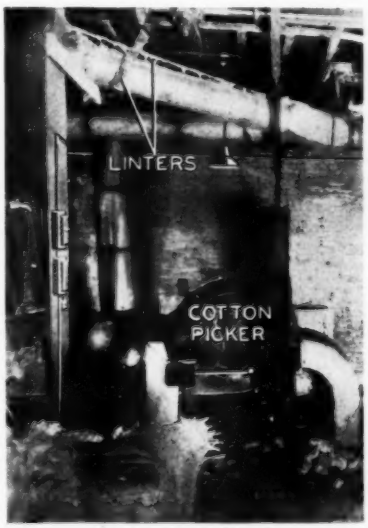
For Class I locations—

1. Printed instructions and cautionary statements on nameplates of apparatus and fittings are to be strictly observed.
2. No attempt should be made to enter any device or enclosure before the circuit is broken at some point ahead. Removal of a cover while the circuit is alive is an invitation to disaster.
3. Before replacing cover, all extraneous dust and grit must be wiped from ground surfaces, and a light mineral oil film put on to prevent rusting.
4. All metal-to-metal surfaces must be free of dents or nicks as these tend to hold the cover away from the enclosure, thereby allowing flame from an internal explosion to escape to the outside.
5. The same infinite care that is taken in machining and assembling the equipment at the factory must be observed in full by the maintenance man.
6. Covers must be reset in position and firmly fastened by screws provided.
7. Lost or worn screws must be replaced as any unfilled or loose screw openings may cause failure.
8. Screw covers and rigid conduit connections must have perfect threads and be screwed tightly so that at least five full threads are always in contact.
9. Setscrews holding screw covers must be tightened so that covers may not loosen and disengage during vibration.

For Class II locations—

1. A daily check should be made to keep all equipment free of dust collections.
2. Covers must be closed tightly.
3. Adjustments and repairs should be made when the atmosphere is not heavy with dust in suspension.

From an electrical standpoint, the necessity for maintaining ground circuits on portable and other equipment is doubly important. Not only is safety assured, but the danger of expensive fire and explosion loss is also thwarted. Proper maintenance is the only safeguard for the men and women working in the factory as well as for the investment of the stockholders in plant and equipment.



INFLAMMABLE LINTERS—*Various electrical devices such as lamps, outlet boxes and switches, must meet requirements for Class III locations. (Crouse Hinds Co. photo.)*

UMI

BY PERFORMANCE

it "WINS FRIENDS and INFLUENCES PEOPLE"

● The rugged construction of this "3C" Special Bulletin 5840 Oil Immersed Primary Resistance Motor Starter may not fit in with ***decor moderne,*** but in atmospheres charged with highly explosive gas, dust, or fumes, you'll be impressed by its protective features.

It's designed and built in accordance with Underwriters Specifications for Class 1, Group D, Hazardous Locations, and with each individual unit of apparatus given wide electrical clearances, plus oil immersion, it's proof against errant danger-laden atmospheres.

Of course, it provides adequate overload protection to the 15 H.P., 440 Volt, 3 Phase, 60 cycle Motor it controls, and on performance alone, this starter wins friends.

Our nearest office will gladly consult with you about "3C" Motor Control for hazardous conditions.

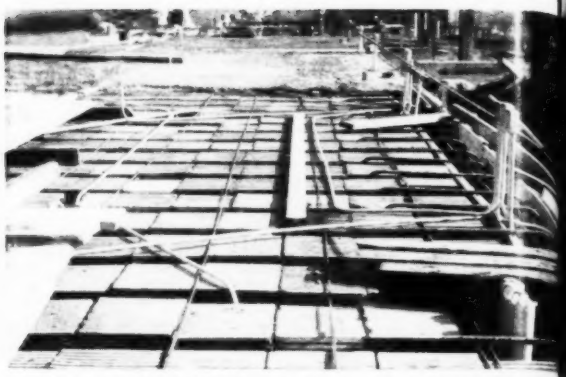
OFFICES IN PRINCIPAL CITIES

THE CLARK CONTROLLER CO.

1146 EAST 152ND ST. CLEVELAND, OHIO

UMI

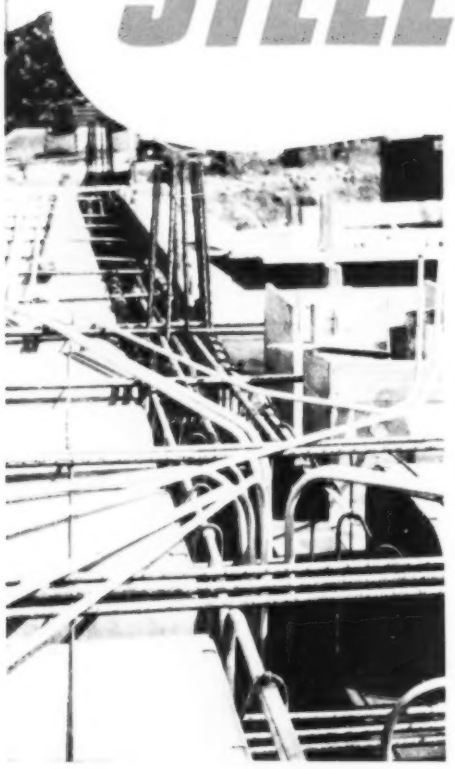
In wiring the Southwest High School, St. Louis, (a concrete installation) S. C. Sachs Company used 90,000 feet of ELECTRUNITE Steeltubes in assorted sizes.



This same electrical contractor used 22,000 feet of ELECTRUNITE Steeltubes in installing the electrical system in this tile and concrete flat building at Washington University, Missouri.

Here's what a prominent contractor

STEELTUBES IN CO



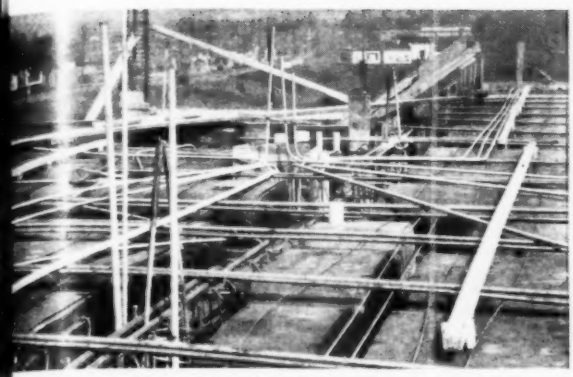
One reason why contractors and workmen prefer ELECTRUNITE Steeltubes is the ease and uniformity with which it bends. A simple, hand, roll-type bender makes perfect bends on the job.

● S. C. Sachs Company are large electrical contractors in St. Louis. They have installed thousands of feet of ELECTRUNITE Steeltubes in concrete, as they say in the letter at the right: ". . . with very fine results." And they continue to use this modern threadless rigid conduit for all types of work.

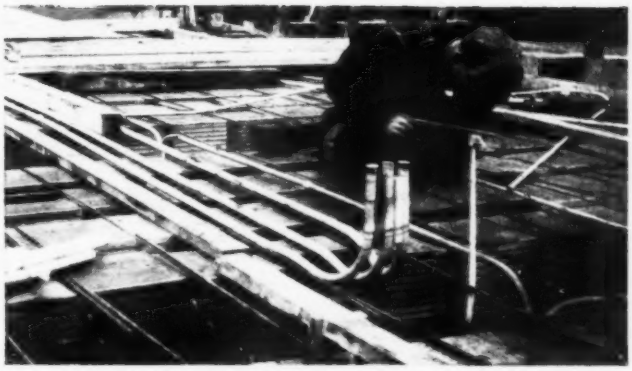
Does their experience and that of other contractors prove to you that ELECTRUNITE Steeltubes is the conduit to use on concrete jobs? If not, try Steeltubes on your next job—and let it prove itself to your entire satisfaction.

Steel and Tubes, *Inc.*
CLEVELAND . . . . OHIO

SUBSIDIARY: REPUBLIC STEEL CORPORATION



Whether long or short, straight or bent, in open places or between paus where working space is limited, runs of ELECTRUNITE Steeltubes are coupled without difficulty. It is not nesessary to turn the line—only the nuts on the couplings.



A 32-tooth blade hacksaw is the only cutting tool required when you use ELECTRUNITE Steeltubes. There are no threads to cut—no dirt, oil and grime—no vises and heavy tools to carry—no damage to the protective zinc coating.

...acts about ...CRETE

GARFIELD 2933

S. C. SACHS CO.
ELECTRICAL ENGINEERING CONTRACTORS
817 NORTH NINTH STREET
ST. LOUIS

July 6, 1939.

Steel and Tubes, Inc.,
224 East 131st Street,
Cleveland, Ohio.

Gentlemen:

In line with information contained in your advertisements showing the use of ELECTRUNITE STEELTUBES in concrete, would like to add that we have used this material in a number of such installations with very fine results.

We have found that ELECTRUNITE STEELTUBES are strong and durable, easy to handle. Our workmen feel less fatigued after a hard day's work when they use your product, and all in all we believe that this material constitutes a forward step in the progress of the Electrical Contracting Industry.

Yours very truly,

S. C. SACHS COMPANY

By S. C. SACHS

SCS:mt

UNDERWRITERS' LABORATORIES INSPECTED ELECTRUNITE RIGID STEELTUBES-B N-57 ELECTRICAL METALLIC TUBING

Look for this label. It is found only on genuine ELECTRUNITE Steeltubes.

Easy To Get

● Warehouse stocks of Bunting Electric Motor Bearings in all markets make it easy for you to get any quantity at any time. Made for all makes of motors from 1/50 hp to 100 hp. . . The Bunting Brass & Bronze Company, Toledo, Ohio. Warehouses in All Principal Cities.

BUNTING

BRONZE BUSHINGS · BEARINGS
PRECISION BRONZE BARS · BABBITT METALS

THESE MOTOR BULLETINS TELL YOU HOW TO SELECT THE RIGHT WAGNER MOTOR FOR EVERY JOB
BULLETIN 177
BULLETIN 182
BULLETIN 179

Wagner fractional-horsepower motors are completely described and illustrated in 52-page Bulletin 177. It also contains scores of illustrations, cut-away views, cross-section drawings, speed-torque curves, etc.

Wagner integral-horsepower motors are completely described in 70-page Bulletin 182. It also includes a complete discussion of the seven electrical types of squirrel-cage motors, totally-enclosed fan-cooled motors, explosion-proof, multi-speed, slip-ring and Fynn-Weichsel motors.

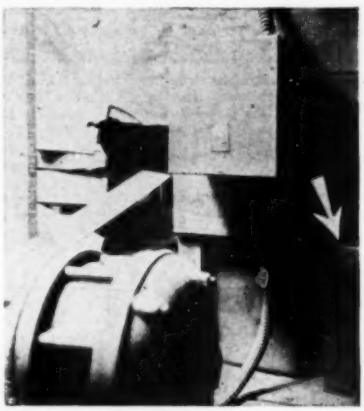
Wagner single-phase and direct-current motors are fully described and illustrated in 18-page Bulletin 179. It also contains valuable information on the larger sizes of Wagner repulsion-start-induction motors, repulsion-induction and direct-current motors.

Every electrical contractor should have these Bulletins. They're FREE. Write for your copies today.

Wagner Electric Corporation
6400 Plymouth Avenue, Saint Louis, Mo., U.S.A.
MOTORS • TRANSFORMERS • FANS • BRAKES

Pushbuttons for Ease and Safety

With magnetic starters operated by pushbuttons, there is little excuse for the operator to stand in either a dangerous or uncomfortable position. In one installation a pushbutton was located about 12 inches from the floor. Exactly what the idea was, is pure guesswork. Perhaps the carpenter located



CONVENIENT? *Yes, a magnetic starter, but the pushbutton is only one foot above the floor.*

it or maybe the crew did not have enough conduit or wire.

Such cases are rare in well designed and operated plants. But some of the older plants might consider relocating starters and pushbuttons, to promote safety and efficiency.

Accessibility and convenience of control are important. Consider all locations before making future installations.

To Reduce Welding Fires

Suggestions for preventing fire caused by portable cutting and welding equipment have been issued by the inspection department of the Associated Factory Mutual Fire Insurance Companies, Boston. Some 591 such fires in a group of plants recently analyzed have caused a loss of $652,000 over a period of nine years.

The chief danger appears to be in the use of such equipment in unsafe locations, or without proper precautions. Many operators also fail to realize that sparks or globules of hot metal often ignite combustible material at distances of 35 ft. and over. The suggested remedy is to forbid the use of cutting or welding equipment unless the location has been inspected and approved by a responsible authority. The nine major points are—

1. Appoint a competent supervisor with authority to establish and enforce suitable

ATTENTION
ELECTRICAL CONTRACTORS

Another of the series of advertisements sponsored by the RLM Standards Institute and directed to the individual users of lighting equipment is reproduced here to keep you informed on the work being done in your behalf.

PROPER LIGHT CONDITIONING *requires* RLM LABELED LIGHTING REFLECTORS

OF THE various types of "conditioning" which improve employee efficiency, product quality, and industrial relations, LIGHT CONDITIONING is one of the most important. Basic to proper LIGHT CONDITIONING in your plant are the RLM specifications, setting standards of performance, output and quality for industrial lighting reflectors. Nine manufacturers now make RLM Dome, RLM Deep Bowl, RLM Symmetrical Angle reflectors and RLM Silvered Bowl Diffusers in accordance with these strict specifications. The RLM label is a certificate of performance to these specifications certified to by an independent testing laboratory. This label is your assurance of these four essentials of a good lighting installation:

1 MORE LIGHT AT NO EXTRA COST—High reflection factor and output specifications increase total light reflected from lamp.

2 BALANCED LIGHTING—The quantity of light delivered by a reflector does not alone determine its efficiency. Even distribution and adequate diffusion from the porcelain enamel reflecting surface of RLM label reflectors is equally important to proper LIGHT CONDITIONING.

3 QUALITY PORCELAIN ENAMEL REFLECTING SURFACE—RLM specification high quality Porcelain Enamel is the most durable of all reflecting surfaces. Being easier to clean, maintenance costs are reduced to a minimum.

4 WARRANTY OF UNIFORM QUALITY—A rigid inspection and testing system conducted by the Electrical Testing Laboratories of New York, an independent testing organization, insures continuous conformance to RLM standards by manufacturers of RLM labeled reflectors.

The letters RLM stand for Reflector and Lighting Equipment Manufacturers

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THE CERTIFICATE OF RLM UNIFORM QUALITY

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QUALITY and ECONOMY go together IN JOHNSON LEADED BRONZE ELECTRIC MOTOR BEARINGS

WRITE FOR FREE CATALOGUE

Distributors Wanted

If you sell Electrical Supplies, investigate the profit possibilities in Johnson Electric Motor Bearings – No obligation.

● Bearing QUALITY is proven through performance; ECONOMY through long bearing life. Johnson Bearings will out-perform and out-last any similar product on the market. Correct in design, alloy and tolerance they will slip right into your housing and over your shaft with no trouble at all. Available – from stock – for more than 230 different motors. Write for free catalogue – TODAY.

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For Better Service – INSTALL TRICO REG. U.S. PAT. OFF.

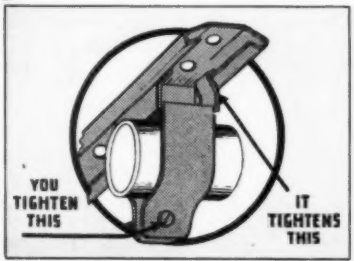
RENEWABLE FUSES
With the famous *powder-packed* element
KANTARK "ONE-TIME" FUSES
With genuine fibre tubes (not paper)
COLORTOP PLUG FUSES
Color tells the size
TRICOMATIC PLUG FUSES
With built-in thermal time-lag element
KLIPLOK CLAMPS
Lock fuses and clips together
TEST CLAMPS
For heavy duty testing
FUSE PULLERS
For safe handling of fuses
AUTOMATIC OILERS
For motors, line shafts, etc.

Send for your new Folder CPF-300 TODAY!
TRICO FUSE MFG. CO., MILWAUKEE, WIS.
In Canada—IRVING SMITH LIMITED—Montreal

TRICO POWDER PACKED FUSES
STOP WASTED KILOWATTS AND WASTEFUL SHUTDOWNS

With Only One Screw to Tighten . . .

THE CLEVELAND CONDUIT HANGER



Gives You a Quicker Easier Installation

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"CONVINCE YOURSELF"
"Send for Circular Giving Full Details"

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THE CLEVELAND SWITCHBOARD CO.
2927 E. 79 St. Cleveland, Ohio

precautions, allowing work only under a signed permit, in designated areas and by experienced operators. Insist on precautions by outside contractors as well as by employees.

2. Always keep automatic sprinklers in service during cutting and welding.

3. Use no cutting and welding equipment in unsprinkled combustible buildings, or where floors and partitions are not tight. Sweep down floors and wet down wooden floors or cover them with sheet metal or equivalent. Prevent sparks from outdoor work entering building openings.

4. Before starting work, remove any combustible material at least 35 ft. or protect by asbestos or sheet metal curtains or guards. Shut down processes exposing combustible fibers or materials. Remove dust deposits which might be exposed to sparks.

5. Do not permit cutting or welding near flammable liquids or combustible vapors or gases. Thoroughly ventilate locations where such liquids or vapors have been present.

6. Do not work on closed containers which may have held flammable or combustible materials. A film of such material on metal surfaces may produce explosive vapors when heated. Purging with air, steam or flooding with water is sometimes effective.

7. Do not do cutting or welding on ducts unless sure these are clean and free from combustible deposits.

8. Watch for sparks and drops of hot metal by using extra men with fire extinguishing equipment, observing cracks, openings, curtains, guards and floor conditions, for at least 30 minutes after operations.

9. Keep all equipment in good condition, using according to maker's instructions.

Cutter for Asbestos Paper

Usually there is considerable waste, when a piece of asbestos paper is taken from a roll. Difficulty is experienced in cutting or tearing the paper because of its texture.

A simple method for cutting has been suggested. A piece of wood (a 2 x 4) with a $\frac{1}{4}$-in. slot, 1-in. deep, is used as a "straight edge". It is placed below and slightly in front of the roll of asbestos. When the paper is pulled out for the length required, a straight cut can be obtained by drawing a knife across the slot, and thereby leaving an even edge on the roll for the next user.—*Westinghouse Maintenance News.*

Electric Furnace Reduced Costs

At the L. V. Johnston Tool Co., Nashville, Tenn., rejects were as high as 25 per cent of the total number of parts worked on. This was because of the

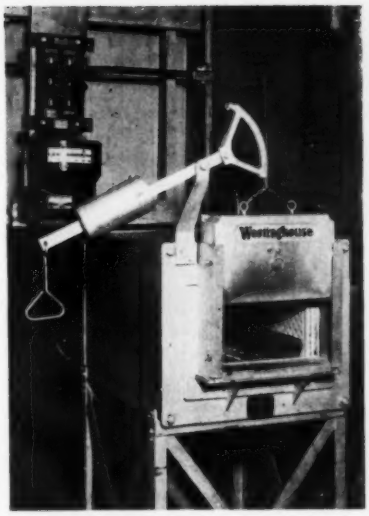
high standards that have to be met in the manufacture of fine tools. Die parts and tools warped and cracked during the hardening process. Hardened parts were often distorted and covered with scale, necessitating a high dimension tolerance and excessive grinding during the finishing operation.

According to L. V. Johnston, the president, this problem was solved by installing an 8-kw. electric furnace, replacing an oil-fired furnace. Automatic control was provided by an indicating pyrometer and contactor panel.

The process is as follows: Partially machined parts are placed in the furnace and heated to approximately 1,450 to 1,475 deg. F. Then they are soaked as specified by the steel manufacturer. The parts are then removed and quenched in oil, after which they are placed in an electric furnace for drawing. Immediate benefits are obtained.

The finish is improved because 50 per cent of scale is eliminated. Absence of warping permits machining of parts to closer dimensions before hardening, and cuts the cost of subsequent grinding by 35 per cent. The life of hardened parts has been increased 25 to 50 per cent.

Temperature is now uniform and can be accurately controlled. The furnace requires less attention. With oil fumes and smoke eliminated, and with less heat in the immediate vicinity of the furnace, working conditions are better. Also improvement in quality of product has brought in a new type of business—the hardening of parts for other manufacturers who desire to obtain superior results.



LOWER UNIT COST *of finished product was effected by this box-type furnace with automatic temperature control.*

Mr. Johnston says—"We know that duplicate parts will be of the same quality and meet our precision standards. Likewise, the quality of a reproduced part will be the same as the part previously furnished. Improved finish, absence of warping, fewer rejects, and reduction in cost of grinding give a lower unit cost of finished products, with longer life and satisfied customers. Production has been increased and parts can be furnished in less time than with the previous method of heat treating. Electric heating has taken care of the problem for us."

CLOSER TOLERANCES *were obtained after an electric heat-treating furnace was installed at the L. V. Johnston Tool Co. Earl Hendrickson (left) is explaining this fact to L. V. Johnston, President.*

TELESCOPE BM SYSTEM

CONNECTORS AND COUPLINGS

Cadmium Finish for Electrical Metallic Tubing

B-M Connectors and Couplings make the neatest installation. No nuts to tighten, just two squeezes with our Indenter and the fitting is securely fastened to the tubing.

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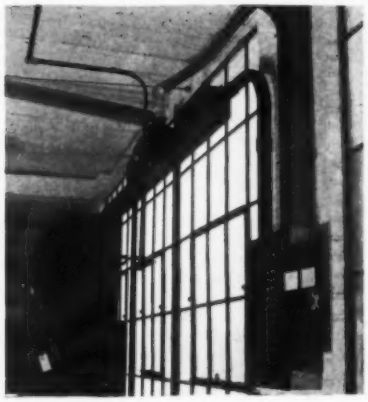


LIGHTING PANEL *has 20 circuits, with sixteen 35-amp. and four 15-amp. branch circuit breakers. It is fed from end of bus distribution run. (Bull Dog photos)*

SUB-ASSEMBLY TABLE—*Small power tools, soldering irons, additional lights can be plugged into duct sections on the tables. Janitor finds his cleaning task is easier*

Bus Systems Give Flexibility

Modern electrical distribution systems have brought flexibility and economies to the Simplex Radio Co., Sandusky, Ohio. Electric light and power is distributed through the medium of flexible and convenient bus distribution systems —a trolley duct for lights and small tools, and a bus duct for heavier loads.

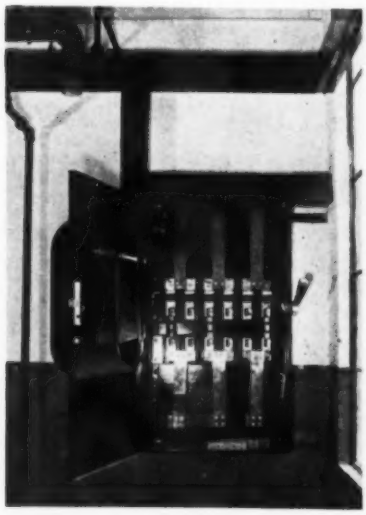
The bus duct system is a decentralized form of distribution. Interconnected sections of duct with bus bars enclosed have openings on two sides permitting branch circuit control devices to be plugged in. Power for machines is tapped off from the bus duct, by contact fingers of plugs engaging the copper bus bars. Wires are led from these control devices to motors and other loads, and branch circuit protection is provided near each load. Approximately 270 ft. of this system in the Simplex plant offers unlimited flexibility in the arrangement of machines.

The trolley duct system consists of duct sections in which 50-amp. copper bus bars are enclosed. Approximately 7,000 ft. of the trolley duct is installed. Six 350-ft. runs are suspended from messenger cable stretched across the building. RLM reflectors are wired to terminal type trolleys and the luminaries spaced out overhead to meet the lighting needs.

Runs of trolley duct are also installed over six production lines, each 240 ft. long, designed for radio chassis assembly. Small tools and appliances can be plugged in at points most convenient to the operator. This materially speeds up work.

Likewise sections of trolley duct are installed on sub-assembly tables, where power is derived from overhead duct runs. Thus sub-assembly tables can be moved about without interrupting the power supply.

So changes in production and test set-ups will not catch the Simplex management unprepared. The company has found that electric power can be used efficiently and economically with the aid of these bus distribution systems.



MAIN SERVICE SWITCH—*800 amp., 230 volts A.C., 4 pole S.N., arranged for connection to sections of bus distribution*

THREE RUNS *of trolley duct, each for a different voltage, to meet all radio testing requirements*

Air Circulation in Hot Locations

Pedestal-type air circulators improved working conditions and helped keep production up to schedule, in the plant of American Seal-Kap Corp., Long Island City. The company manufactures caps for milk bottles and lids for drinking cups.

GOOD AIR CIRCULATION *provided by a pedestal-type fan helped to keep production up to schedule especially during the summer months.*

In the department for the cutting, printing and waxing operations, the employees must work in the immediate vicinity of heated wax tanks. When the humidity was high, particularly in summer, the air in the department was oppressive. The men frequently would have to leave their jobs. As a consequence, production decreased. The situation was worse for the evening shift, when windows on the west side of the building had to be closed at 9 p. m. because of certain local conditions.

To provide air movement in the department, five 28-in. two-speed pedestal-type fans were installed. These fans were placed where desired and have been a great help in keeping production up to schedule.

"Just because it's so roomy, now you won't live with us any more!"

There is plenty of room in Allen-Bradley solenoid starters. The generous wiring space eliminates cramped wiring and skinned knuckles. The white interiors, many knockouts, and easy-to-get-at terminals make wiring simple and easy.

Also, Allen-Bradley starters have no bearings, pins, or pivots to stick, and no flexible shunts to break. The silver alloy contacts require no cleaning or filing. That's why they last so long.

Save time . . . reduce installation expense . . . insure continuous production by using Allen-Bradley solenoid starters throughout your plant.

Bulletin 709 Solenoid Starter. Note the ample space in the cabinet for wiring.

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL

QUALITY

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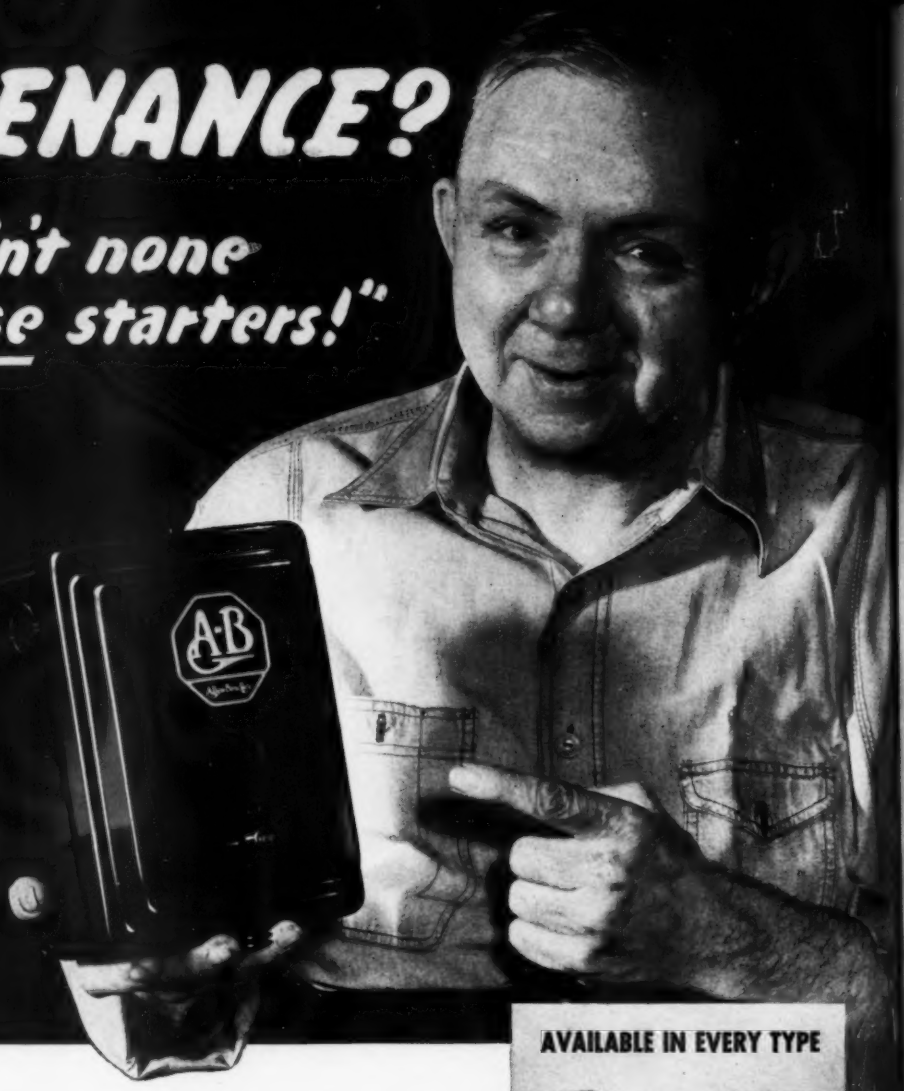
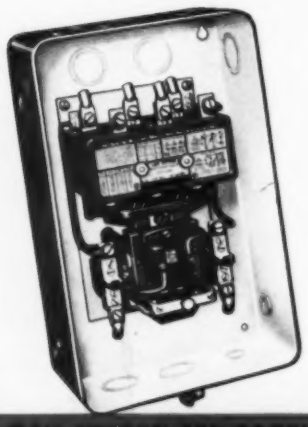
"MAINTENANCE?

- there ain't none with these starters!"



"From the day you put in Allen-Bradley starters (and installing 'em is easy as A-B-C) you can forget about control troubles. You can say good-bye to contact cleaning. You never have to touch the silver alloy contacts. In fact, there ain't no maintenance of any kind when you put in these Allen-Bradley solenoid motor starters. There is lots of difference between them and other starters."

Five reasons why Allen-Bradley Solenoid Starters give less trouble



NO CONTACT MAINTENANCE
The double break, cadmium silver alloy contacts never need filing. They are always in perfect operating condition.

SIMPLE CONSTRUCTION
No bearings, no pivots, no flexible jumpers, no complicated mechanisms. Such simplicity insures freedom from trouble.

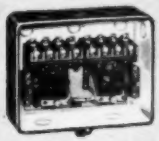
GREATER SWITCHING CAPACITY
These solenoid starters will easily interrupt currents of not less than ten times their maximum horsepower rating.

NO UNNECESSARY SHUTDOWNS
Allen-Bradley solenoid starters do not open and interrupt production when line voltage conditions are momentarily bad.

LONG CONTACT LIFE
Because valuable contact material is not filed away, the contacts last many times as long as ordinary contacts.

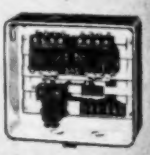
AVAILABLE IN EVERY TYPE

COMBINATION
Bulletin 712 A-C Combination Starting Switch with hand disconnect switch.



REVERSING
Bulletin 705 A-C Reversing Switch for starting and reversing motors.

MULTI-SPEED
Bulletin 715 Multi-Speed Starter for two-speed, squirrel-cage induction motors.



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Company_____

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QUALITY

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SERVICE EQUIPMENT

1 Bulletin No. 58, covering 16 pages of data on service equipment, load centers and panel boards assembled with type AC circuit breakers. Frank Adams Electric Co.

PUMPS

2 Catalog Bulletin No. 40-60A, consists of story of the Burks super-turbine pump, three new larger capacity heavy-duty units and new complete series of Burks super-turbine educer systems for deep well application. Decatur Pump Co.

FLUORESCENT LAMP FIXTURES

3 Catalog No. 110, showing fluorescent lamp fixtures for wallcases, showcases, fitting rooms, bank cages, wall displays, show windows, decorative, cove, strip and general lighting, color matching, drafting tables, inspection. Day-Brite Lighting, Inc.

WIRING DEVICES

4 Catalog No. 15, consisting of 52 pages of data on adaptor sockets, bases, bushings, caps, combination devices, convenience outlets, cords, covers, current taps, cutouts, heater plugs, plates, receptacles, reducers, sockets and switches. Circle F Mfg. Co.

FITTINGS

5 Catalog No. 12F, illustrating and describing entrance fittings, conduit bodies, flush switch fittings, vaporproof light fittings, explosionproof fittings and bell transformers. Killark Electric Mfg. Co.

CABLE TERMINATORS

6 Bulletin 102, illustrating and describing a line of terminating potheads for lead and rubber covered and other braided cables. Also includes information on conduit end bells, conduit wiping caps, wiping sleeve terminators, flange adaptors, and special terminators. O. Z. Electrical Mfg. Co., Inc.

INSTRUMENT

7 Bulletin No. 157 on Model "JP" Ground-Ohmers. It is modified for geophysical tests and investigations, permitting instrument to be used also for measurement of soil resistances. Herman H. Sticht & Co.

FLOODLIGHTING

8 Folder GEA-3100, entitled "Floodlighting for Schools and Colleges," tells of a proved plan for building school sports. GEA-3218 called "How to Floodlight Football Fields" gives the details of what a successful installation involves. General Electric Co.

BELTING

9 A 36-page booklet entitled "Belting Biographies" describing and illustrating a complete line of transmission and conveyor belts. Shows case histories and presents data on selection of proper belt, installation, speed of operation, pulley size, tension, carrying capacity, numerous types of transmission drives and conveyor layouts. United States Rubber Co.

LOOM MOTORS

10 Booklet F-8484, describing totally enclosed loom motors of one-half to two horsepower, adaptable for special applications. Westinghouse Electric & Mfg. Co.

PRECISION LATHE

11 Bulletin No. 43, illustrating and describing three new models of the Workshop Precision Lathe. South Bend Lathe Works.

LIGHTING FIXTURES

12 Catalog No. 13, showing commercial lighting fixtures, providing direct and luminous indirect types of lighting. They are designed for use in stores, restaurants, schools and offices. Chase Brass & Copper Co.

INSTRUMENT

13 Bulletin Section 400, describing and illustrating instant current measurements with the Crompton Tong Test ammeter. Columbia Electric Manufacturing Co.

DOOR CHIMES

14 A broadside showing installation photographs of chimes in homes. Also data and photographs of different styles of equipment. A. E. Rittenhouse Co., Inc.

LAMP LOWERING HANGERS

15 Catalog No. 39, consisting of 40 pages of data, photographs and diagrams of lamp lowering hangers, shock absorbers, accessories. Thompson Electric Co.

THERMOGUARD

16 Booklet F-8490 describes Thermoguard, an automatic watchman developed for protection against burnouts in almost any type of fractional horsepower motor. Westinghouse Electric & Mfg. Co.

INSTRUMENTS

17 Leaflet MB-203 on insulation resistance testers lists models Mb-6 and MB-8. Leaflet RC-115 on conductivity bridges and dip cells, lists model RC-1-B. Industrial Instruments, Inc.

TRANSFORMERS

18 Leaflet B6007 on small auto transformers for serving electric tools, appliances and lights requiring 120 volts from a 240 volt supply line or to reduce light flicker on a secondary distribution circuit. Leaflet B6008 on signal transformers in sizes from 500 to 50 volt amperes for use in railway, traction and other service requiring low voltages. Allis-Chalmers Mfg. Co.

CAPACITOR INSTRUMENT

19 Catalog No. 167-A, eight pages, featuring the line of C-D capacitor analyzer, bridge and decades. Outstanding features of these instruments are listed. Cornell-Dubilier Electric Corp.

FLUORESCENT LAMP AUXILIARIES

20 Bulletin 392-FL describes auxiliaries for use with fluorescent lamps. It contains essential data, such as wiring diagrams, dimensional sketches and electrical specifications. Jefferson Electric Co.

OIL CIRCUIT BREAKERS

21 Descriptive Data 33-745, describing outdoor oil circuit breakers for framework or pole mounting, manu-

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ally or electrically operated. Westinghouse Electric & Mfg. Co.

FLUORESCENT LIGHTING EQUIPMENT

22 Form No. 19393 describes and illustrates fluorescent lighting equipment. Pittsburgh Reflector Co.

FRICTION CLUTCH

23 Catalog illustrating and describing standard type of friction clutch with metal to metal frictions, as well as Super-Johnson type with Raybestos faced expansion ring. Carlyle Johnson Machine Co.

CABLE

24 Catalog giving description, applications, physical and electrical properties of rubber insulated power cable. Consists of 54 pages. Anaconda Wire and Cable Co.

ELECTRICAL PRODUCTS

25 Bulletin C-2, describing and listing Kolton line of cartridge and plug cutouts, slate fuse blocks, dead front cutout covers and neutral blocks. Kolton Electric Mfg. Co.

ATTIC VENTILATORS

26 Bulletin No. 316, illustrating and describing "Ventilattic" fans for homes, stores, clubs, theatres and hotels. Dimensions, performance data and prices are given. Peerless Electric Co.

SERVICE STATION LIGHTING

27 Bulletin No. 63, containing 36 pages of illustrated material on service station lighting. Typical lighting layouts, engineering data, curves and charts. Goodrich Electric Co.

ATTIC FAN

28 Bulletin No. 11639 describes and illustrates a new series of attic fan blades added to the AIRISTOCRAT line. Also gives guaranteed performance ratings. Torrington Mfg. Co.

INSTRUMENT

29 Bulletin No. 173 presents Model DM megohmer with triple color grading scale. Illustrations and diagrams also given. Herman H. Sticht & Co.

ELECTRICAL SPECIALTIES

30 Catalog No. J-239, consisting of 84 pages featuring electrical specialties. It is also a handbook on motor and other maintenance equipment, with many illustrations and specifications. Ideal Commutator Dresser Co.

PLUGS AND RECEPTACLES

31 Bulletin No. 1140-1 illustrates and describes Triploc and multiple unit plugs and receptacles. Bulletin No. 1140-3 gives data on general purpose plugs, receptacles. Pyle-National Co.

AUTOMATIC CONTROLS

32 Catalog No. 300 features automatic controls for heating, air conditioning, refrigeration and various industrial applications. Mercoid Corp.

LIGHTING FIXTURES

33 Catalog No. 40 entitled "Personality Lighting Fixtures," presents a selection of residential and commercial designs. Price list is also given. Moe-Bridges Corp.

TESTING INSTRUMENTS

34 Bulletin 1600 describes six different types of instruments that operate on the "Megger" cross-coil ohmmeter principle. James G. Biddle Co.

WIRE CATALOG & HANDBOOK

35 A 92-page catalog on magnet wire and coils for every type of service. Also a small size pocket handbook containing technical tables of information to the shopman and engineer. Anaconda Wire and Cable Co.

MOTOR CONTROL EQUIPMENT

36 A folder describing and illustrating Type "TT" manual starters, as overload protection for small motors. Trumbull Electric Mfg. Co.

SWITCHGEAR

37 Bulletin B6012—12 pages—illustrates and describes complete line of vertical-lift metal clad switchgear, covering advantages, construction details and uses. Bulletin B6011 gives data on indoor cubicle type switchgear. Allis-Chalmers Mfg. Co.

LOAD CENTERS

38 A 12-page catalog covering No-fuze multibreaker load centers. Illustrations and outline dimensions given. Bryant Electric Co.

TACHOMETERS

39 Bulletin No. 720, showing complete line of hand tachometers with single, three and four ranges, covering many commercial requirements, from 30 to 40,000 RPM. Herman H. Sticht & Co.

DRILL CHART

40 A chart showing correct size of super-carbide tipped masonry drills for expansion shields or anchors. Super Tool Co.

FLOURESCENT LAMPS

41 A 16-page booklet entitled "Engineering data on Fluorescent Mazda Lamps. It gives lamp operating data, lamp performance factors, auxiliaries, operating characteristics, color quality and application considerations. General Electric Co.

PANELBOXES

42 A catalog describing and illustrating the Murray panelbox system, two-wire, three-wire and four-wire. Typical wiring diagrams are given. Metropolitan Device Corp.

PUMPS

43 Bulletin No. 115A, covering pumps, self priming, super turbines and straight, self priming centrifugals for semi-industrial applications. Decatur Pump Co.

CIRCUIT BREAKERS

44 Bulletin GEA-3143, entitled "Modern FH Breakers March on In

[Continued on page 64]

Circle numbers, sign and paste on a penny postcard or mail in an envelope.

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Steel". It emphasizes advantages of FH cubicles and presents the performance record of the Type FH breakers. General Electric Co.

FLOOD LIGHTING

45 A folder featuring the Reflecto, Quarto, Elipso and Diffuso units for floodlighting parking lots, service stations, athletic fields and amusement parks. Goodrich Electric Co.

SOCKET METER TROUGHS

46 A 12-page catalog listing the Walker line of socket meter troughs and boxes for indoor and outdoor use. Listings include combinations with service switches and circuit breakers. Walker Electrical Co.

MOTOR PRICE LIST

47 Bulletin B6010, giving list prices, dimensions and applications of a.c. and d.c. motors, as well as typical electrical and mechanical variations for special purposes. Allis-Chalmers Mfg. Co.

LIGHTING

48 Catalog No. 5, consisting of 32 pages of data and illustrations on architectural lighting for commercial and residential use. Kent Metal Manufacturing Co.

CHIMES

49 A folder illustrating and describing Snapit electric door and signal chimes. Marks Products Co., Inc.

SYNCHRONOUS MOTORS

50 Bulletin GEA 137D is a descriptive folder on types TS low-speed synchronous motors. The General Electric Co.

CAPACITOR MOTORS

51 Folder F-8485 describes 1/20 hp to 3/4 hp capacitor motors. Features cutaway photos, dimensional and typical installation data. Westinghouse Electric and Manufacturing Co.

WIRE METERS

52 A six page catalog section describing a series of "Productimeter" wire measuring meters. Application and cost data. Durant Manufacturing Co.

ELECTRIC DRILLS

53 A four page descriptive folder, featuring specification and cost data on a new series of 3/8" to 1/2" electric drills and drill stands. The Van Dorn Electric Tool Co.

NEW BEARING ALLOY

54 Catalog L1, ten pages filled with engineering, application and cost data on new "Leadaloyl" bearings and bushings. Size listing from .186 I.D. to 1.502 I.D. Johnson Bronze Co.

MOTOR STARTERS

55 Bulletin GEA 2964A is a descriptive folder on the new D51 magnetic starter. Features cutaway illustrations and dimensional data. The General Electric Co.

OIL CIRCUIT BREAKERS

56 New catalog 6-C gives up to date data on operating mechanisms and attachments for "Turblator" oil circuit breakers. New catalog 6-D covers technical and dimensional data on two new classes of oil circuit breakers. Roller Smith Co.

DUST IN CONTROLS

57 A new booklet "Dust the Destroyer" explains the effect of dust in control equipment. Tells the advantages of using vertical contact controls. Cutler-Hammer, Inc.

CONTROL RELAYS

58 New catalog 12 covers new Type C control relays for use on circuits up to 440 volts. Descriptive, dimensional and cost data. Roller Smith Co.

LIGHTING FIXTURES

59 An illustrated booklet on fluorescent lighting fixtures for industrial and commercial use. Lumen data also given. Fluores-O-Lite Mfg. Co.

ELECTRIC TOOLS

60 An illustrated 48 page catalog describing the complete 1939 line of Thor portable electric tools. Independent Pneumatic Tool Co.

SOLDERLESS CONNECTORS

61 Catalog 40 contains information, price lists and dimensions on solderless connectors to fit cable, wire, tube, rod and bar. Dossert and Co.

TRANSFORMER

62 Bulletin No. 148 illustrating and describing Powerstat, a variable voltage transformer. Shows performance data curves and also price list. Superior Electric Co.

ELECTRIC EYE

63 Catalog sheets, application data, installation experience and suggestions for marketing the Photobell Sentinel Electric Eye. Photobell Corp.

ELECTRIC PLANTS

64 Three new folders describing and illustrating Katolight, electric plants. Kato Engineering Co.

FLUORESCENT LIGHTING

65 A new folder describing a method of installing fluorescent lamps and showing typical applications and photographs of recent installations. The Wiremold Co.

CONNECTORS

66 A folder entitled "You can't See It" explains the Burndy Servit and tells about friction as affecting service connectors. Burndy Engineering Co., Inc.

WIRING DEVICE

67 Catalog No. 26, consisting of 66 pages of data on adapters, plugs, brackets, circuit breaking devices, outlets, cutouts, lighting unit, switches, outdoor receptacles, plates, lamp receptacles, sockets, and wiring diagrams. Also contains 24 page price list. Arrow, Hart & Hegeman Electric Co.

SPEED DRIVE

68 Bulletin 307 featuring an all-electric adjustable speed drive for alternating current circuits. Reliance Electric & Engineering Co.

BRONZE BAR LISTINGS

69 A reference chart to hang up featuring new size and weight listings of Universal bronze bars. Johnson Bronze Co.

SWITCHES

70 Catalog No. 8, illustrating and describing safety starting switches for motor and lighting circuits. Also gives data on service equipment, manual and magnetic motor controllers, accessories, circuit breakers and relays. Arrow-Hart & Hegeman Electric Co.

TOOLS

71 Catalog No. C-39 consists of data on tool holders; carbon, chrome-vanadium and detachable head socket wrenches; "C" clamps; lathe and milling machine dogs; turret lathe and screw machine tools; ratchet drills; bits, blades and high speed steel; setting up tools; machine shop specialities and pipe tools. Armstrong Bros. Tool Co.

CONTROLS

72 Bulletin 40 describes and illustrates controls—electric floatless liquid level, signal and pump controls, motor starters and relays. Bender Warrick Corp.

PIPE & BOLT THREADING EQUIPMENT

73 Catalog No. 39-A consisting of 32 pages of data and illustrations on pipe and bolt threading equipment. Contains time studies, threading speeds, specifications. Oster Manufacturing Co.

A-C SWITCHBOARDS

74 Descriptive Data 31-133 covers small-plant and industrial ac switchboards with knife switches and fuses. Application and dimensional data also given. Westinghouse Electric and Mfg. Co.

INSULATION

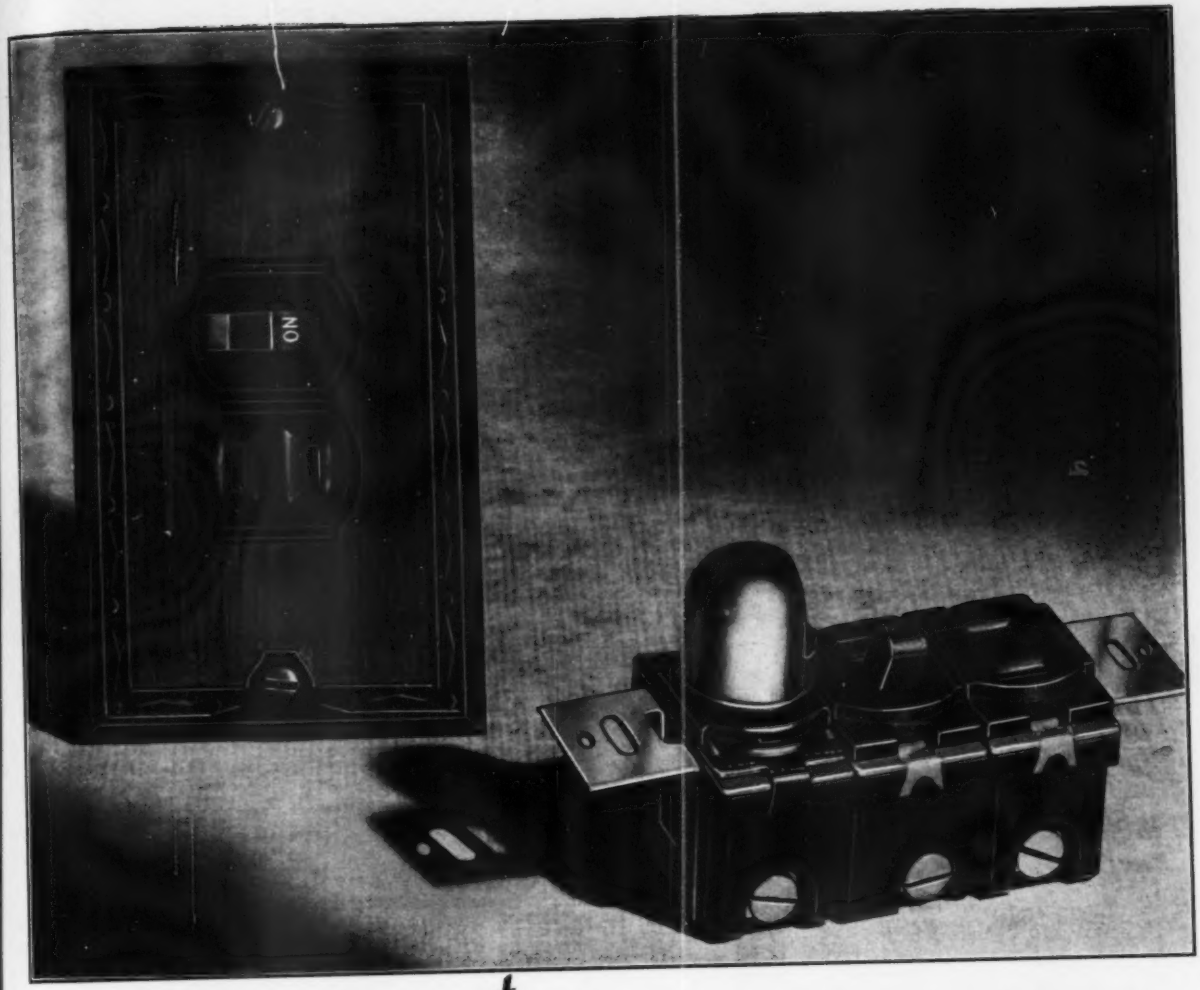
75 An 8 page booklet "Okolite" contains application, installation, design and test data on wire insulation. The Okonite Company.

VENTILATORS

76 Bulletin No. 40, describing kitchen and window ventilating fans. Also features dimensional and cost data. F. A. Smith Manufacturing Co.

REFLECTORS

77 A descriptive leaflet featuring dimensional and cost data of "Reflecto-Duct" for fluorescent lighting. Reflectors, Inc.



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Better Lighting

LIGHTING A CARD ROOM

Since the Detroit Edison Company installed a large scale system of coffer lighting, this method has been used widely. This picture shows the Country Club of Virginia in Richmond.

The area lighted is 1,200 square feet, with ceiling height of 12 feet. The 9 coffers are equipped with 300-watt silvered bowl lamps louvered to eliminate neck brightness. The coffers are spaced on 10′ x 12′ centers and provide about 20 footcandles.

LARGE COFFERS *give 20 footcandles in this club grill room and avoid all glare.*

This installation replaces a system of enclosing globes. It has been so popular that two other clubs in the district have made similar installations.

LIGHTING FOR A GYMNASIUM

The new San Luis Obispo, California, high school gymnasium is lighted by a combination mercury and incandescent system.

It might appear that the spectral quality and stroboscopic effect of the 400-watt mercury lamps would make them unsuitable for this service. However, with 750-watt incandescent lamps on alternate outlets, the spectral quality, although different from ordinary incandescent lighting, was found satisfactory. And using a three-phase four-wire system eliminated the stroboscopic effect.

The lamps are mounted in Glassteel Diffuser equipment and produce 25 footcandles of illumination. The units are suspended on ½-inch conduit stems from self-aligning hangers.

LIGHTING A DAIRY STORE

John W. Moore, electrical contractor of Charleston, West Virginia, and J. M. Gates and Son Co. have combined fluorescent and filament lighting to produce the most talked about installation ever made in that city. It is in the Blossom Dairy store at 711 State Street.

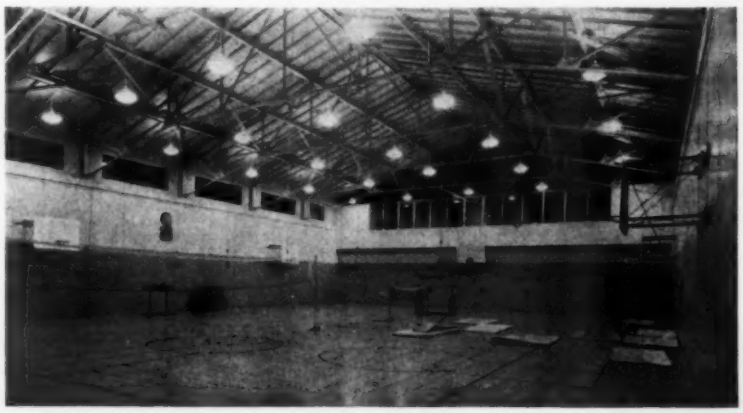
The store is 80 feet long and 20 feet wide with a 14 foot ceiling. The lighting is provided by a built-in cove housing 30 watt daylight and white fluorescent lamps in Daybright Light Strip. These are alternated. The table lighting at the right has recessed units, equipped with 30 watt gold fluorescent lamps and covered with vitrolite glass. Fluorescent lamps are also used in the show case.

CEILING SUNLIGHT—*An interesting treatment of lighting in a dairy store using both gas tubes and filaments.*

The general system of cove lighting provides 12 footcandles with approximately 25 footcandles at the tables from the downlighting system. The installation totals 160 fluorescent lamps and twelve 150 watt filament lamps. These are used outside the doorway in flush covered reflectors and give 50 footcandles of "welcoming light."

COVES AND COFFERS

Coves and coffers are particularly adapted to mobile color and painting with light. Bare inside-frosted or natural-colored bulbs in white trough reflectors may be used to illuminate



MERCURY MAZDA—*This California gymnasium installation has found the way to combine mercury and incandescent lighting with splendid results.*

Day-Brite INSPECTION FIXTURES FOR FLUORESCENT LAMPS

One, Two and Three-Light Units for 18", 24", 36" and 48" Lamps

For production . . . inspection . . . color-matching . . . assembly . . . typesetting . . . etc.

All fixtures are furnished wired with thermal type auxiliaries and include switch, cord, plug and hooks at top for mounting. A flange, tapped for ½" pipe, can be furnished in place of hooks if desired.

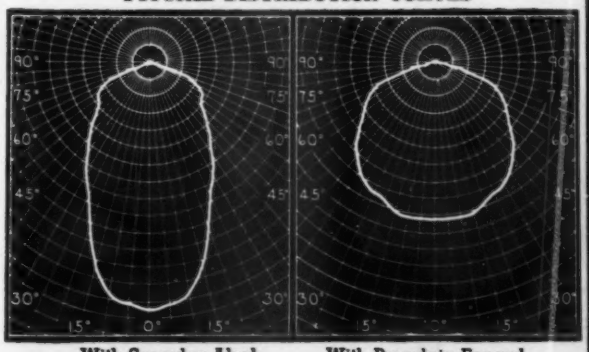
Exterior finish is machinery gray baked wrinkle enamel. Two types of reflectors are available . . . porcelain enamel or specular Alzak. Distribution curves for these two types are shown below.

ENGINEERING

Correct engineering and design of Fluorescent lamp fixtures are of the utmost importance to insure proper distribution of light and maximum intensities. You are assured of these important and essential features with all Day-Brite fixtures. Quality and efficiency are synonymous with the name Day-Brite.

●

TYPICAL DISTRIBUTION CURVES



With Specular Alzak Reflector — With Procelain Enamel Reflector

●

Day-Brite Fixtures are Available Through All Leading Supply Houses

A Complete Line of Fluorescent Fixtures is Shown in Catalog No. 110

WRITE FOR YOUR COPY NOW

●

Day-Brite Lighting, Inc.,

5401 Bulwer Ave. **St. Louis, Missouri**

QUAD

LIGHTING UNITS

★ are in demand

★ they satisfy

★ they build sales

For years QUAD Lighting Units have been demonstrating to Contractors their ability to build sales. Contractors rely on QUAD Units and demand them. They know from experience that they are modern, efficient, and that they satisfy customers' requirements. QUAD offers the right unit for every need—industrial or commercial—indoor or outdoor. You can get more lighting unit sales—stock and sell the QUAD Line.

Duplex Dome Reflector illuminates upper walls and ceiling with diffused light and delivers direct light downward. Louvers in the metal walls divert sufficient light up to relieve unpleasant contrast. White porcelain enameled exterior of reflector and supporting stem are also illuminated. Made in standard ⅛" socket type and with heavy threaded hoods (¼" if specified).

Long Beam Floodlight Enclosed wiring for both single and multiple mounting. One-light units fit over 1½ or 2 in. pipe, while multiples fit over the end of 2 in. pipe. Cast aluminum brackets have wiring space with removable cover and reflector may be adjusted 180 degrees horizontally and tilted 20 degrees up or down from normal vertical position. Beam projectors removable and interchangeable.

QUADRANGLE MFG. COMPANY

32 SO. PEORIA ST. CHICAGO, ILL.

No. 252-R Two Gang Box

Two gang Adjustable Floor Box with No. 208 Receptacle in one section. One cover plate with ½" Flush Brass Plug and the other cover plate with 2" Flush Brass Plug.

FLOOR BOXES AND WIRING SPECIALTIES

No. 110 "Latrobe" Watertight Box

Cut-away view showing how tapered unit receptacle fits tapered opening in top of box body. The last word in design, appearance, and simplicity of installation.

The *Latrobe Line* is complete for all residential, commercial, and industrial requirements. In addition, the entire line is designed with the idea of reducing installation time . . . an important point to consider when selecting floor boxes and wiring specialties

No. 284 Duplex Receptacle Nozzle

With ½" brass pipe extension. Neatest and most compact fitting obtainable. Also available with ¾" pipe extension. Fullman also offers Duplex Telephone Nozzles.

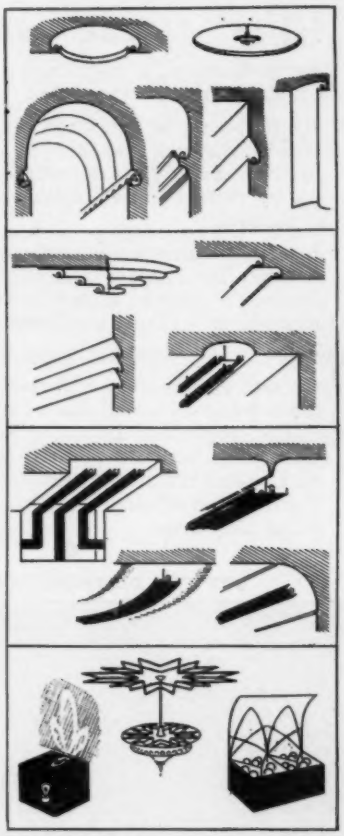
FULLMAN MFG. CO.

LATROBE • PENNA.

[FROM PAGE 44]

surfaces up to four or five feet wide; for longer throws and greater efficiency individual reflectors should be used, preferably with cover glasses to facilitate maintenance.

Multi-plane or overlapping coves offer a means of superposing colors in contrasting patterns without dilution or mixing. Reflecting surfaces can be given unusual decorative value by using corrugations or flutes in simple lines or geometric figures. By lighting from two directions in different colors, the surfaces take on a colorful textured appearance. Mat-finished reflecting surfaces in light, neutral tones are important, for use with the usual types of indirect units. Metallized surfaces or glossy paints are not generally desirable.



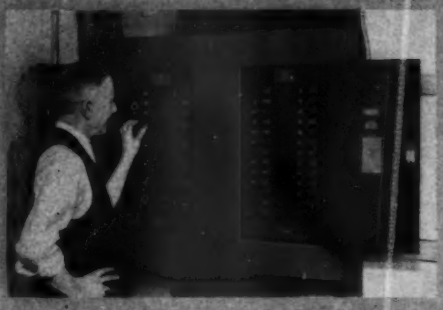
SUGGESTIONS—for cove and coffer treatment to apply decorative lighting to any interior.

Shadow and shadow patterns, particularly those designed for pleasing color effects, are both interesting and intriguing. The term "Colorama" was coined to convey the endless variety in decorative effect possible.

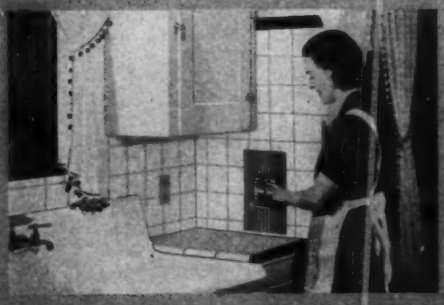
Growing!

A NEW PROFITABLE BUSINESS FOR ELECTRICAL CONTRACTORS

Nofuze lighting panelboard in a department store



Nofuze circuit protection in a chain of modern service stations



Nofuze Multi-Breakers in thousands of homes

ARE YOU GETTING YOUR SHARE?

You can no longer be the first to make money with Westinghouse Nofuze equipment, but you can get on the band wagon today to get your share of this growing business.

Westinghouse Nofuze equipment protects circuits without fuses. It is safe, convenient and lasts as long as the wiring itself. There is nothing to replace. And it is approved by Underwriters' Laboratories.

Easy to install . . . costs little if any more than ordinary forms of circuit protection.

Stop at your nearest Westinghouse wholesaler's office, or see his representative for prices, sizes, and especially for the quickly installed units for Range and Water Heater Wiring. Investigate Nofuze equipment today.

J-60298-A

Westinghouse Electric & Mfg. Company
East Pittsburgh, Pa.

Westinghouse Nofuze Protection

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In the News

FIRST REGIONAL A/W MEETING BIG SUCCESS

More than 100 men representing local Adequate Wiring Bureaus gathered for the Pacific Coast Regional Conference on adequate wiring promotion. They came from eight states and from Canada and spent August 17 and 18 in San Francisco.

All doubt was cleared as to the ability of the industry to sell adequate wiring to new residences. Disagreement showed on the possibilities of selling re-wiring for adequacy, however. To develop this old building field, need was expressed for new technique not yet evident.

The chief fruit of the meeting was the exchange of field experience, ranging from full certification, or Red Seal operations in other localities, to isolated promotion by individual contractors. A plan was recommended and discussed for joint operations by six or eight contractors, through a separate organization to do re-wiring on a mass production basis, backed by utility co-operation in sales and inspection economies through posting a blanket bond.

Keynote for the meeting was set by its chairman, Ralph Wiley, chief of San Francisco's Department of Electricity, who said that "selling adequacy involves convincing the consumer of the necessity for sufficient outlets and copper capacity to permit any desired use of lighting or appliances with assurance of convenience, safety and proper voltage. The problem he declared is one of sales which should be "stripped of technicalities and dressed with all of the customer appeal and glamor which the industry is capable of producing."

The conference passed three resolutions —one requested NEMA to consider placing a replica of a duplex outlet in the package of every small appliance sold, the replica to explain something about adequate wiring and suggest that the customer secure information from a contractor or the utility. Another endorsed the Code adoption of thin-wall insulation and the proposal to permit the use of more space in conduit as an aid to re-wiring. A third proposed the appointment of national industry committees to (1) specifically define adequacy as applied to wiring and (2) to study the desirability of changing the Code table on the carrying capacities of wires.

EEI BOOKLET ON BARE NEUTRAL

The advantages that would come in using bare neutral systems are presented by the Wiring Committee of the Edison Electric Institute in a booklet entitled "Commercial and Industrial Building Re-wiring Market." This completes the three booklets prepared by EEI in promoting the proposed changes in the Code.

In considering the urgent need for more copper in these buildings, the re-wiring problem is diagramed. The benefits that would be obtained by the use of thin wall insulation are pictured and the characteristics of the wire, as already made by seven manufacturers are catalogued. Interesting diagrams show the possibilities for installing larger capacity and the current carrying capacity of No. 14 wires as determined by the recent NEMA study.

Picturing what is called the "geometry of raceway systems," cross section views of various combinations of conductor sizes make clear the mechanical advantages offered by the use of a bare neutral system. With the same conduit fill, it will provide 50 per cent more capacity when combined with three insulated conductors, for example, as a 3 phase, 4 wire feeder.

The statement is made that many buildings are so wired. No facts are given as to where these buildings are located. Also no mention is made of the possible consequences of a reversal of polarity.

Further data covers field tests on insulated and bare conductors, advantages of the 3 phase, 4 wire system, as well as conduit fill tables. Two case studies of unidentified buildings rewired with bare neutral are given.

In a section headed—"What to Do About It," the EEI urges power companies to assign personnel to the promotion of these proposed new wiring systems under special permission in cooperation with local inspectors; to rewire the power company's own buildings; to sell the idea to building owners and managers.

EEI BOOKLET ON COVERED NEUTRAL

The case for covered neutral cable is argued in a booklet just issued by the Wiring Committee of the Edison Electric

"Yes, I'm the one who phoned to have a house re-wired—there it is!"

NOW! Porto-Power BENDS 7 SIZES OF PIPE WITH ONE COMPACT TOOL

New S-36

SUPER-RANGE BENDER HANDLES up to 4"

NEW S-36 shown bending 4" pipe. Operator controls quick 20-ton ram action from hand-operated pump.

CONTRACTORS and Plant Electricians everywhere have asked for a Porto-Power Bender to handle up to 4 inch pipe. Blackhawk DOES MORE than meet this demand—Blackhawk adds time-saving refinements to the remarkable Porto-Power Pipe Bending principle and creates the NEW MODEL S-36! Here are some of the BIG FEATURES:

SUPER RANGE—Model S-36 bends rigid conduit and pipe in popular 1¼", 1½", 2", 2½", 3", 3½" and 4" diameters.

NO JACK KNIFING—No loose extension bars, tension arms and ram collars . . . the Bending Frame is ONE sturdy unit!

SPEEDY SET-UP — "Pull Pin" with Lock-on fitting quickly fastens four-sided Pivot Shoe in any one of six positions on Bending Frame. No bolts and nuts—no monkey wrenches.

LIGHT WEIGHT — Bending Frame and ram with 4" bending set-up weighs only 128½ lbs. Entire S-36 weighs only 190 lbs.

ROLL TO THE JOB—Pivot shoes on ends of Bending Frame have large rims—serve as wheels for rolling bender along floor.

POWERFUL HYDRAULIC UNIT — 20-ton all-directional ram coupled with high-pressure swivelled hose and hand-operated pump. (Ram also used with special attachments for pulling pulleys, gears, etc., and for wide range of press, push, and lift jobs in construction and maintenance).

RETRACTO-RAM—Finger-turn of pump release valve causes ram plunger to retract automatically — to proper distance for successive positioning of pipe after each bend.

LOW-COST — Porto-Power is standard equipment in dozens of other fields—permitting low-cost production of the perfected remotely controlled hydraulic unit.

ORDER FROM your Industrial Supply house TODAY — or send coupon to Blackhawk for catalog and prices. Pay for Porto-Power on the next job through big savings in time and materials!

A Product of **BLACKHAWK MFG. CO.**
MILWAUKEE, WIS.
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SOLD THROUGH ESTABLISHED INDUSTRIAL SUPPLY HOUSES

BLACKHAWK

WRITE Now!

BLACKHAWK MFG. CO., Dept. P2099, Milwaukee, Wis.

RUSH new Pipe Bender Catalog and prices—also name of nearby distributors.

Name .....

Company .....

Address .....

In the News

[FROM PAGE 70]

Institute. This is the second in a series of three booklets being published by the committee to promote the Code changes recommended by the power companies.

The title of this booklet is "Covered Neutral Cable Helps Sell Adequate Home Wiring"! The booklet makes the statement that "covered neutral cable assemblies make it possible to sell adequate wiring at much decreased unit costs with equal or increased safety". But no installation experience is given to support this statement. Houses wired with covered neutral are pictured but not identified as to where they are located or who did the work.

Again the booklet states that "electrical contractors will benefit from increased business resulting from a larger use of simplified materials. Experience in localities where these materials have been employed prove conclusively that this is the case. This pamphlet contains endorsements of contractors and facts on the benefits they have received." But the localities are not named and the so called "contractor endorsements" give no names, no cities and no figures. They are merely five unsigned general statements.

Interesting definite statements are given, however, as to installations of similar covered neutral assemblies installed in buildings by the Thomson Houston Electric Company in 1888 and still in use; one in a Richmond, Va., residence; others in the Hickox Building in Cleveland, the Masonic Temple Building in Buffalo and the Grand Hotel in Cincinnati. Pictures of this cable are shown.

The following points are stressed in behalf of covered neutral cable—

Easier to handle.
Lower in cost.
Polarity positively identified.
Larger percentage of copper in the assembly.

Safety is attested by letters from inspectors of Detroit and Omaha.

Successful performance is claimed for 6243 jobs installed in 350 communities in 20 states.

This booklet, therefore, does not give evidence that "covered neutral cable helps sell adequate home wiring" except by implication and broad general statements. It does present interesting pictures of this assembly that is still unfamiliar to many, and how it is installed. In this it will be interesting to contractors.

INCREASING CAPACITY of existing feeders by higher voltage distribution and transformer step down at feeder ends is one solution to over-load conditions in skyscraper office buildings. So says S. C. Sachs of the S. C. Sachs Company, electrical engineers and contractors of St. Louis, Mo. This method, he says, has already been effectively applied to several of the older structures in that city.

NORTH AND SOUTH—When Duluth and New Orleans get together, it looks like experience is certainly getting around. But here you are—with F. H. Mielke of Mielke Electric Co., Duluth, talking it over with Leonce Bonnecaze of Best Electric Co., New Orleans, at the recent NISA meeting in St. Louis.

REGIONAL A/W CONFERENCES IN CHICAGO, PITTSBURGH

Two more regional conferences of electrical men interested in the National Adequate Wiring Campaign are scheduled for September, following the successful meeting in San Francisco.

Men of the Middle West will gather in Chicago September 21 and 22 at the Electrical Association headquarters. Men of the north Atlantic states will meet in Pittsburgh September 28 and 29 at the Duquesne Light Building.

Both these conferences will review experience, methods and policies. A large attendance is expected.

EASTERN INSPECTORS PROGRAM

Eastern inspectors will gather in Providence for the 15th Annual meeting of the Eastern Section, IAEI, on October 2, 3 and 4. The program offers much meat.

W. J. Donald, managing director of NEMA will discuss "Factors Affecting the Future of the Electrical Industry." James D. Lynett, chief electrical inspector of New York City will talk on "Fluorescent Lighting in High Wattage Flush Units." Samuel Rosch, chairman of the NEMA committee on capacity of wires will give some background on that committee's recent report. M. M. Brander of Underwriters' Laboratories, will talk on the installation of panelboards. And there will be a discussion of the changes in the Code proposed by the power companies.

The meeting will be held at the Providence Biltmore Hotel.

NEW PROMOTION is to be put behind wiring, commercial lighting and industrial modernization in northern California, with the organization of a Northern California Division of the Pacific Coast Electrical Bureau. George W. Barker, formerly of the staff of Electrical West, (left) is manager. Sitting next is Ken Ryals of Stone-Ryals Electric Co., president of the Electrical Contractors Assn. of Northern California, and a member of the Bureau executive committee.

TRENTON PLANT MEN ORGANIZE

Another maintenance engineer group has been organized—this time in Trenton. It has been launched by the Central Jersey Electrical League. Harry Ambler of Sloane Balbon Co. is president. S. G. Szabo of General Motors Co. is vice president. Everett Wood of W. R. Thropp Sons Co. is treasurer. Ronald T. King of the League will serve as secretary.

Similar maintenance groups are now operating in Newark, N. J., Philadelphia, Cleveland, Youngstown, Chicago and St. Louis. They discuss maintenance problems, make plant inspections and hold joint meetings with other groups of electrical men to listen to educational addresses on equipment and practice.

NEMA ON BUILDING WIRE

As a contribution to the current discussion of proposed Code changes, NEMA has just published a report on "Small Diameter Building Wire". A committee headed by C. O. Hull, of the General Electric Company, has just completed an investigation. The purpose was to study

New PROFIT Possibilities *with* SURFOLETS

Listed as Standard by Underwriters' Laboratories

For:

HOMES

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COTTAGES

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BASEMENTS

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FARM BUILDINGS

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FACTORIES

Investigate the profit possibilities in Porcelain Products' Surfolet outlets. Learn how contractors are cutting installation time and effecting savings on wiring materials through their use.

Surfolets are installed in almost half the time necessary to install conventional surface outlets.

No clamps, connectors or grounding, and less conductor, are needed, thus providing additional savings in material.

Smart, modern design, sturdy, maintenance-free construction feature customer appeal, while all-porcelain construction and Underwriters' Laboratories' approval assure safety.

Offer Surfolets on your next surface wiring job for *increased profit* and for *customer satisfaction*. Write for complete information today.

SURFOLETS—The answer to all surface wiring problems.

No. 8400. This base standard under all Surfolet outlets
No. 8460 Pull Chain Lamp Base
No. 8420 Keyless Lamp Base
No. 8410 Tumbler Switch
No. 8430 Duplex Flush Receptacle
No. 8440 Rosette
No. 8450 Blank Junction Box

PORCELAIN PRODUCTS, Inc.

FINDLAY, OHIO

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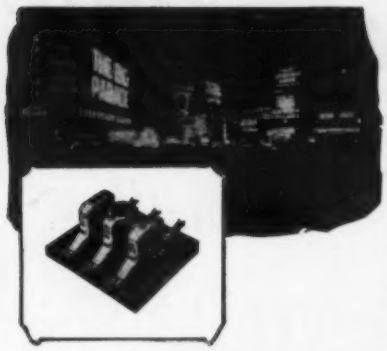
Get Credit for a good Job



With plenty of new money now being used to build schools, hospitals, municipal buildings, for alterations to stores and business places, your wiring specifications should include the use of

"DIAMOND H"
REMOTE CONTROL SWITCHES

There are no finer light control devices designed to turn lights "on" and "off" from convenient points, than these. Wherever many circuits feed many lights a simple form of control is essential and "Diamond H" Remote Control Switches provide this.

There are many applications that occur in your daily jobs—flood lighting, window and sign lights, in office buildings, parks and stadiums, wherever groups of lights need easy control. Where emergency circuits are used in schools, theatres and hospitals, places where failure of light may be a hazard to life, the automatic throwover switch is dependable. Our new automatic Mercury Tube double throw switch, capacities up to 30 amps, has many applications where emergency circuits are used. It is small, compact and inexpensive.

Send for Bulletin 10-CC which tells about these switches and data furnished for their proper use. Gladly sent without cost for your files.

The HART MANUFACTURING CO.
HARTFORD, CONN.

DIAMOND H SWITCHES

In the News

[FROM PAGE 72]

the effect of thin wall insulation and more wires in conduit upon temperature in the pipe and the possibilty for increased capacity and lower installation cost for a given load.

As a result of tests described in the report the committee recommends that—

1. A building wire with a smaller overall diameter of the new thin insulation is practical and should be incorporated in the Code.

2. The present Code requirements for maximum area in conduit to be occupied by wire should be retained.

3. Maximum permissible current carrying capacity of a wire depends not alone upon temperature surrounding the wire, but also upon the permissible operating temperature of the insulation. Insulation of the new small diameter wire should be capable of continuous operation at 75 degrees C.

4. Current carrying capacities for the new small diameter heat resistant wires expressed in amperes, are—

No. of Wires in One Standard Rigid Conduit

Cond. Size AWG	One, Two or Three	Four, Five, or Six	Seven, Eight, or Nine
14	22 Amp.	18 Amp.	15 Amp.
12	27 "	22 "	19 "
10	37 "	30 "	26 "
8	49 "	39 "	34 "

COMING MEETINGS

International Association of Electrical Inspectors—Western Section, Hamilton, Ont., Sept. 11–15; Southern Section, Asheville, N. C., Sept. 18–22; Eastern Section, Providence, R. I., Oct. 2–6.

International Association of Electrical Leagues—Fourth Annual Conference, Auditorium of Electrical & Gas Association of New York, Inc., Grand Central Palace Building, New York, Oct. 4–6.

National Electrical Contractors Association—Annual Convention, Bellevue-Stratford Hotel, Philadelphia, Pa., Oct. 9–12.

National Electrical Wholesalers Assn.—Semi-Annual Convention, Hotel Gibson, Cincinnati, Ohio, Oct. 16–20.

National Electrical Manufacturers Association—Annual Conference, Palmer House, Chicago, Oct. 23–27.

PACIFIC COAST INSPECTORS AGAINST BARE NEUTRAL

Pacific Coast electrical inspectors, from both the Northwest and Southwest Sections, have voted on the proposed Code changes. Meetings in San Francisco, August 14 to 17th, endorsed thin wall insulation and the recommendations of the Article Committees on conduit fill and covered neutral cable. They voted against the approval of bare neutral.

Added PROFITS
from these exhaust fans

Taverns, restaurants, garages, club rooms, dining rooms, laundries, etc., need proper ventilation. These are your prospects. Sell them Signal Exhaust Fans and Shutters. Exhaust Fans available in sizes from 12" to 24". Signal Fans have all the latest features, yet prices are low. Send for latest catalog with prices, if you do not have one.

SIGNAL ELECTRIC MFG. CO.
Menominee, Michigan
Offices in all principal cities

SIGNAL

MINERALLAC HANGER

Conduit 3/8"—2 1/2"
Cable to 2 1/8" (with Bushings)

Cadmium and Everdur
MINERALLAC JIFFY CLIP

Sizes from .250" O.D. Tubing to 1 1/4" conduit.

See your Jobber

New York City Office
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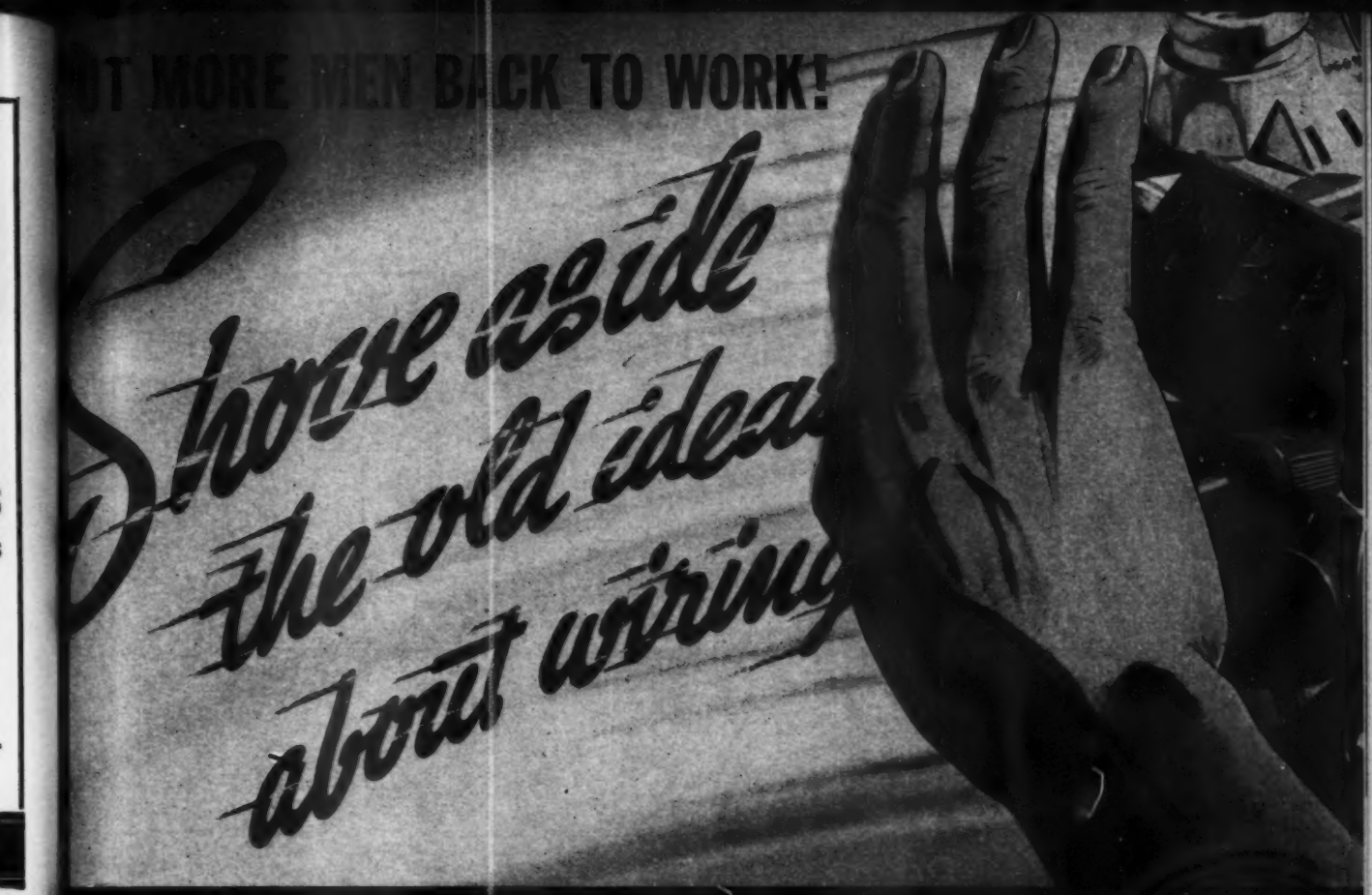
50 Church Street

MINERALLAC ELECTRIC CO.
25 N. Peoria St., CHICAGO



PUT MORE MEN BACK TO WORK!

Rewiring with profit. The easiest, quickest, most profitable way to rewire is with "Plug-In" Strip.

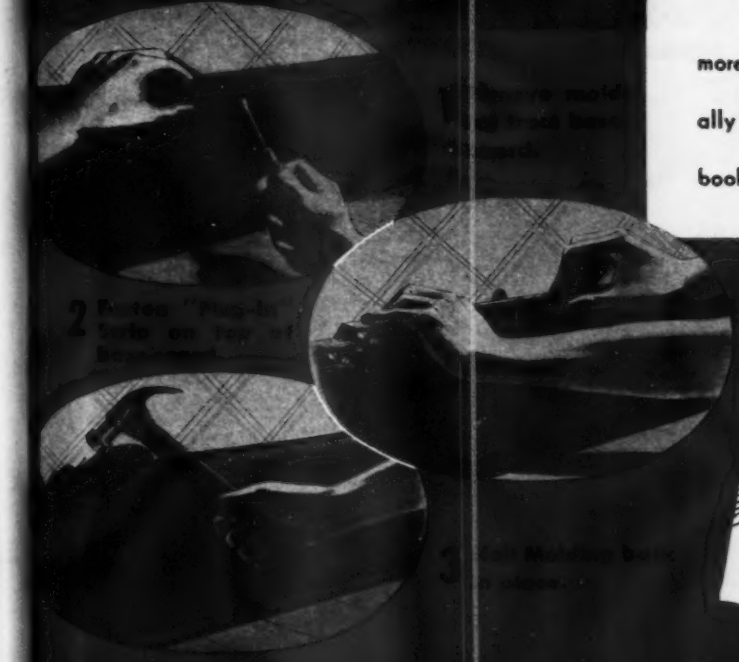
Take off baseboard trim, shove in "Plug-In" Strip and replace trim.

No muss - plaster - painting - no fuss.

Give them what they are asking for - more outlets - more places to plug-in.

No other method of rewiring effectively and economically fulfills the customer's wants.

Put more men back to work. Write today for the handbook "The New Method of Circuit Wiring."



National Electric Products Corporation · Pittsburgh, Pa.

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"THERE!.. THAT'LL KEEP YOU OUT OF TROUBLE!"

The dependability of this long-lasting friction tape is *built in.* It is made of only top quality fabric and adhesives, scientifically treated to retain pliability and to resist the elements. It handles quickly and easily... adheres firmly. A first-class tape for a first-class job.

AMAZON-VICTOR-STICKA
FRICTION TAPE
DISTRIBUTED BY
GraybaR

IN 1869 GRAY & BARTON
70th ANNIVERSARY
GraybaR
ELECTRIC COMPANY
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OFFICES IN 83 PRINCIPAL CITIES. EXECUTIVE OFFICES: GRAYBAR BLDG., NEW YORK

CORNELL-DUBILIER
ELECTRIC CORPORATION
1048 Hamilton Boulevard, South Plainfield, New Jersey

In the News

[FROM PAGE 74]

Principal speakers were Dr. Morton G. Lloyd, head of the U. S. Bureau of Standards and president of IAEI; E. A. Brand of the EEI Wiring Committee; and A. R. Small, chairman of the Electrical Committee. Speaking of bare neutral Mr. Lloyd said:

"A bare conductor inside a run of conduit is entirely superfluous and a waste of both copper and space. Since the bare conductor will be in contact at many points with the conduit, the conduit will be carrying part of the current anyhow and is fully capable of carrying all of it. One would be unable to tell, after an installation has been made, whether the bare copper wire had been run the entire length of the conduit or merely had been projected a few yards into each end. As I see it, the question consequently resolves itself into one of whether the conduit system itself should be used as a return conductor."

Mr. Brand presented the reasons why the power company group advocates the eight Code changes. Mr. Small said that "the purpose of the Code is not to build business for central stations or contractors or make work for electricians but to safeguard persons and property from fire hazards." But he agreed that there is a responsibility to go forward with research on new ideas and developments.

Three Code breakfasts combed over (1) the "unsatisfactory performance of fittings for electric metallic tubing," (2) emergency lighting in theaters, and (3) administration methods and problems. James I. Dixon, of Santa Clara, was elected president of the Southwestern Section. Blaine Grey, of Salt Lake City, was made president of the Northwestern Section.

NEW MARK FOR MOISTURE PROOF WIRE

Dissatisfaction has developed over marking the new low moisture absorption rubber covered wire by tags stating that it is suitable for use without a lead covering in moist locations. The Underwriters' Laboratories approve this wire in moist locations only when enclosed in a raceway.

It is now announced that after January 1, 1940, each length of this wire will be continuously identified either by printing the type letters "RW" on the outer covering or on a tape under this covering. This new marking will help the inspector check the job and help the contractor identify broken coils of wire in his stock room.

WISCONSIN ADOPTS CODE

The national electrical code will be made part of the Wisconsin state electrical code as the result of a meeting of electrical inspectors from all parts of the

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IF YOU SELL APPLIANCES — OR WANT TO PROMOTE ADEQUATE WIRING . . . .

Look into the FUSTAT

1 **Thermal Cutout.** Stops needless blowing on starting currents of washing machines and other appliances — yet opens to protect if wiring is dangerously overloaded.

Permits washing machines, ironers, refrigerators, etc., to be plugged in on circuits already well loaded — without needless blowing of fuses.

This wipes out many useless service calls that irritate customers and often cost dealer time and money — particularly if made during the guarantee period.

2 **Fuse Strip.** Prevents hazardous burnout of short-circuits.

Shorted cords on lamps, irons, cleaners, etc. must be kept from burning up — shorted sockets, attachment plugs, etc., must be kept from sputtering hot sparks.

As is well known there is no substitute for a proper size fuse to protect against such commonly occurring shorts.

On short-circuits, the Fustat, because it has a fuse, opens the circuit before dangerous arcing can occur.

3 **Fustat Base.** Prevents destruction of circuit wiring from overloading . . . Permits adding any number of outlets to a circuit . . . Eliminates low voltage complaints due to overloading — because it keeps the circuit from being loaded beyond capacity.

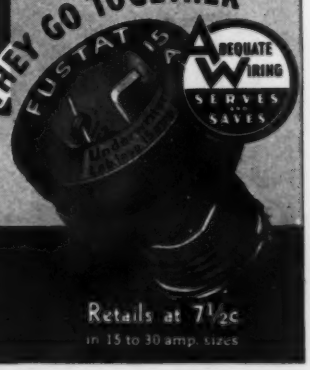
Once the proper size Fustat is installed it cannot be replaced with substitutes or sizes that are too large.

Retails at 7½c

If circuits are not adequate, the user cannot dodge the issue by bridging the fuse or by over-fuseing and sacrificing safety.

The Fustat fits Edison base fuseholders through the use of an inexpensive adapter that locks in place.

THEY GO TOGETHER



The FUSTAT

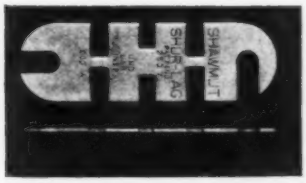
For Full Information write to any of these Firms

BUSSMANN MFG. CO., University at Jefferson, St. Louis, Mo.
JEFFERSON ELECTRIC COMPANY, Bellwood, Ill.
KIRKMAN ENGINEERING CORP., 121 Sixth Ave., New York City
NATIONAL ELECTRIC PRODUCTS CORP., Fulton Bldg., Pittsburgh, Pa.
UNION INSULATING CO., 27 Park Place, New York City

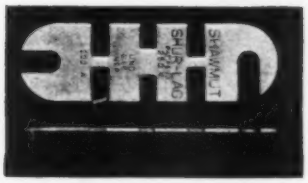
Retails at 7½c
in 15 to 30 amp. sizes

UMI

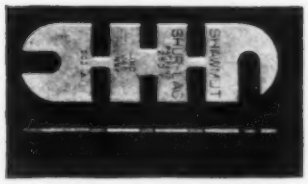
A SHAWMUT FUSE IS THE FUSE TO USE



Shawmut links



are of uniform



thickness throughout

their length

No added thickness, no welded joints

SHUR-LAG

RENEWABLE FUSES

THE CHASE-SHAWMUT COMPANY

NEWBURYPORT, MASSACHUSETTS

In the News

[FROM PAGE 76]

state held Aug. 15 in Milwaukee with John Wise, electrical engineer of the state industrial commission.

Supplements to the state code issued since the last complete code was published in 1934 were made part of the new code.

ALL TENNESSEE POWER NOW PUBLIC

All properties of the Tennessee Electric Power Company, a subsidiary of Commonwealth & Southern Corporation, has been sold to the Tennessee Valley Authority and 38 municipalities and rural electrical cooperatives on August 15. This completed public ownership of the production and wholesaling of electric power in Tennessee. The whole transaction involved $78,600,000.

The transaction is not expected to bring about any drastic rate revision, as Tennessee Electric Power rates have already been revised to line up with the rates of government owned TVA properties. The transfer from private to public ownership has raised a critical tax problem, however—had to compensate for the loss of $2,800,000 in taxes previously paid yearly by the Tennessee Electric Power Company. The bond issues used to purchase the property are largely tax free.

CALIFORNIA COORDINATION

California's electrical contractors will meet again in a statewide convention at Asilomar, near Monterey, Sept. 22, 23. At this meeting, some sort of state coordination between the NECA chapters in southern California and San Francisco and the Electrical Contractors Association of Northern California will be worked out.

Paul Geary, field representative of the NECA Labor Relations Committee will address the meeting. And prominent representatives of IBEW will be on the program. The Monterey Peninsula contractors will be the hosts.

REA BARGAIN EQUIPMENT

REA has announced that electrical equipment manufacturers are going into production on an REA-designed transformer-circuit breaker-lightening gap-cable assembly that can be sold to cooperatives or private utilities at $35 to $45. With a capacity of only 600 va., the unit is intended for the temporary introductory

SHERMAN

BRASS FIXTURE CONNECTORS

CROSS SECTION SHOWING BRIDGE

COMPLETE CONNECTION BEFORE TAPING

A PERFECT SOLDERLESS CONNECTION

Only one size needed—fits all wires, No. 12 or smaller—only three parts, all brass — high conductivity — rust-proof. Impossible to make a poor connection — bridge prevents wires from passing through and getting under wrong screw.

Send for Trade Bulletin No. 10

H. B. SHERMAN MFG. CO.
BATTLE CREEK MICHIGAN

MULTI
Fluorescent
LAMP FIXTURES

MEET EVERY REQUIREMENT .... THOUSANDS OF IMMEDIATE OPPORTUNITIES ....

Methods of lighting change rapidly and 'Multi' Engineers are ever alert to the need for the most modern efficient lighting available. That is why more and more progressive executives are turning to 'Multi' for solution of their lighting problems. There are many opportunities in every locality for the aggressive contractor to increase his business in this general demand for more modern and efficient lighting. 'Multi' Fluorescent Fixtures embody many new features in construction and design. Send for free descriptive circular.

MULTI
ELECTRICAL MANUFACTURING CO.
1840 W. 14th ST., CHICAGO, ILL.

HAZARD armored CABLES

HAZARD ARMORED CABLE, Type AC has a flame-resisting, moisture-proof paper sheath between the conductors and spiral interlocked steel armor. A ripcord beneath the paper facilitates installation. The insulating bushing is inserted at the cut ends over the paper sheath.

HAZARD ARMORED THERMOCABLE has heat-resisting rubber insulation on each conductor, colored for identification, and armored for mechanical protection. Insures positive operation of control apparatus for heating and air-conditioning systems.

HAZARD ARMORED GROUND WIRE with tinned copper conductor without insulation, armored for protection. The armor makes grounding assurance doubly sure.

HAZARD FLEXIBLE STEEL CONDUIT is offered as a single unit. This strong but flexible conduit saves time and expense for short runs, or where many bends must be made.

A complete line carried by
ELECTRICAL JOBBERS

HAZARD INSULATED WIRE WORKS

DIVISION OF THE OKONITE CO.

PASSAIC, NEW JERSEY, AND WILKES-BARRE, PENNSYLVANIA

New York Chicago Philadelphia Atlanta Pittsburgh Buffalo Boston Detroit Seattle
Dallas Cleveland San Francisco St. Louis Los Angeles

UMI

Profit by USING

ILLINOIS

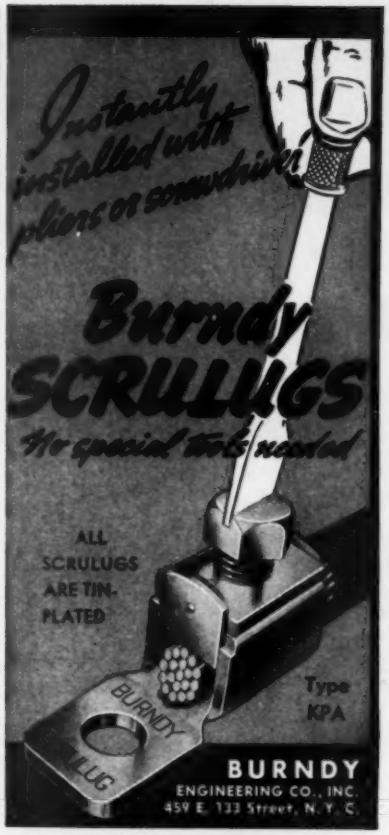
Dependable Porcelain

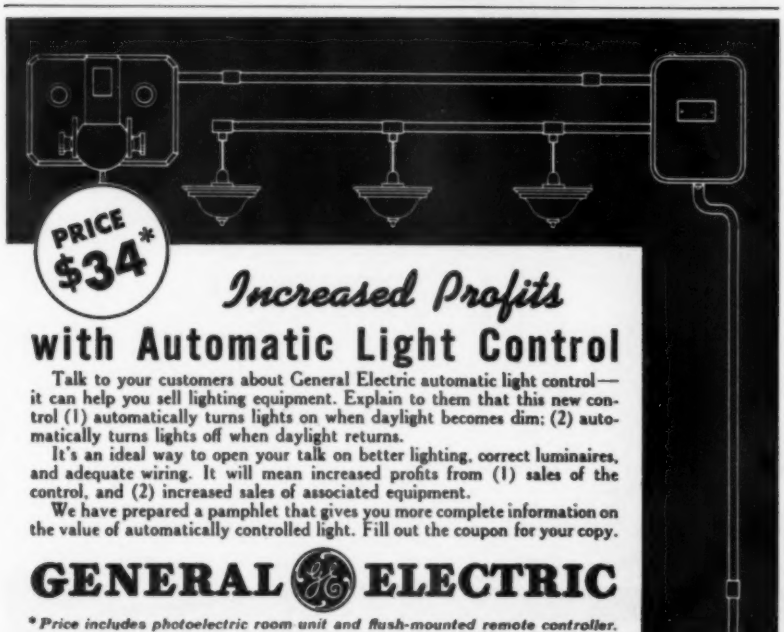
OUTLET BOXES

★Glazed and unglazed styles conforming to all existing standards of dimensions, spacing, position of knockout holes, and mounting screws. High mechanical and electrical efficiency.

Contractors who use these products not only establish themselves most securely with their customers but also build their business by making each job a true quality one. Send for bulletin.

ILLINOIS ELECTRIC PORCELAIN CO.
MACOMB, ILL.





Increased Profits
with Automatic Light Control

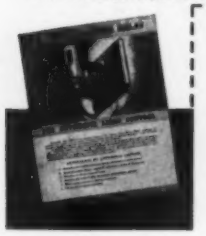
Talk to your customers about General Electric automatic light control—it can help you sell lighting equipment. Explain to them that this new control (1) automatically turns lights on when daylight becomes dim; (2) automatically turns lights off when daylight returns.

It's an ideal way to open your talk on better lighting, correct luminaires, and adequate wiring. It will mean increased profits from (1) sales of the control, and (2) increased sales of associated equipment.

We have prepared a pamphlet that gives you more complete information on the value of automatically controlled light. Fill out the coupon for your copy.

GENERAL ELECTRIC

*Price includes photoelectric room unit and flush-mounted remote controller.



General Electric,
Dept. 6—201, Schenectady, N. Y.

Please send me a copy of *G-E Photoelectric Relay for Automatic Light Control* (GEA-2679).

Name_____

Address_____

_____

686-170

In the News

[FROM PAGE 78]

connection of farmers to existing power lines at a special minimum rate of a dollar a month. Economies in the design include use of a bakelite transformer case, a magnetic-type circuit breaker and a new combination cable and ground

REA appliance financing has started with two IES lamps, one floor type, one table, to be sold through dealers at $9.95—$.95 down and $.95 per month. Different manufacturers have developed different designs with REA approval and are selling to dealers at $5.75 to $6.

WITH THE Manufacturers

GRAYBAR CHANGES

Graybar Electric Company announces the following reorganization of its general sales department in New York, affecting personnel of interest to electrical contractors:

E. A. Hawkins becomes general sales manager; D. C. Guest, sales manager—outside construction; L. W. Taylor, assistant sales manager—outside construction (Chicago); G. K. Heyer, general power apparatus sales manager; E. J. Dailey, power apparatus sales manager; A. E. Hetzner, signalling sales engineer; Herbert Metz, general lamp and lighting sales manager; R. C. Kinney, lighting sales manager; K. B. Hopkins, advertising manager.

•

Steel and Tubes, Inc., has appointed Huston Colcock, agent for its conduit products in the New Orleans district. His territory will include the southern parts of Mississippi and Alabama, the western section of Florida and all of Louisiana, except Caddo and Bossier Parishes. He is located at 828 Burdette Street.

S. W. Sharbrough has been made agent for Electrunite Steeltubes and Fretz-Moon conduit for the state of Texas. His headquarters will be at 2427 South Ewing Avenue, Dallas, Texas.

•

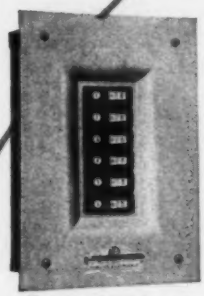
R. W. Cramer Co., Inc. of Centerbrook, Conn., has announced the appointment of the following new agents: H. C. Johnson and J. J. Gaffney, 82 St. Paul St., Rochester, N. Y.; Edward B. Rouzer, 615 So. 16th St., Omaha, Nebraska, and Anderson-Bolds, Inc., 1836 Euclid Ave., Cleveland, Ohio.

UMI

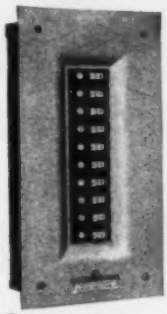
Easy.. .. ..

TO CHANGE CIRCUIT CAPACITIES . . . .

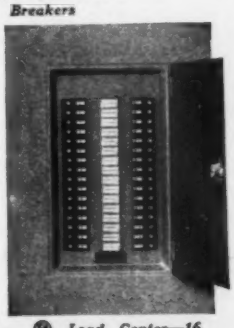
Changes in Branch Circuits made by removing only two screws and inserting another breaker of the required capacity . . . Saves time . . . Avoids delays.



FA Panelboard — 32 Single Pole FA AC Circuit Breaker Branch Circuits



FA Service Equipment with D. P. 50 Amp. AC Circuit Breaker Main and 6 S. P., AC Circuit Breakers



FA Load Center—16 Single Pole FA AC Circuit Breaker Branch Circuits

Type AC CIRCUIT BREAKER

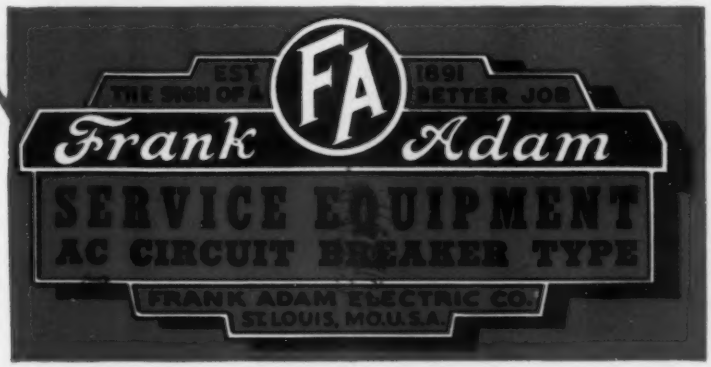
The heart of FA Service Equipment, Load Centers and Panelboards —this New FA Type AC Circuit Breaker offers the following advantages:

Positive Automatic Protection . . . The new FA Type AC Circuit Breaker cannot be held closed or blocked to prevent automatic opening on short circuit or sustained overload. The mechanism trips free from the handle. This means positive, automatic protection . . . Because of proper time lag characteristics, needless circuit interruptions are prevented when momentary overloads occur.

Operation — Convenience . . . On short circuit or sustained overload, the breaker quickly opens the circuit . . . This moves the handle from the "ON" to the "OFF" position . . . Service can be quickly restored by manually returning the handle to the "ON" position . . . There is no intermediate position of the handle.

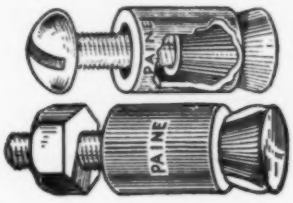
Capacities . . . 15 to 50 amp., inclusive — single and double pole, individual trip — 120 volts AC.

Send for Bulletin No. 58 . . . Frank Adam Electric Co., St. Louis, Mo.

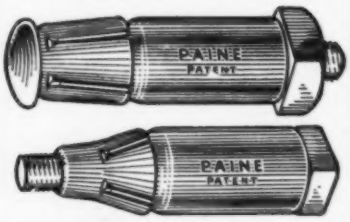


PAINE
ANCHORS
for Dependability

To insure dependable, permanently secure anchorage in all walls, floors or materials standardize on PAINE ANCHORS. Improved design built on extensive tests under all working conditions, give PAINE ANCHORS far greater holding strength—a wide safety factor you can rely on.



PAINE LEAD ANCHORS. These are the safest anchors for fragile materials, yet are equally effective in brick, stone, marble, etc. Their ease and simplicity of installation and permanent dependability save far more than the original cost. Embodying strong rustless cone and a specially developed lead-mix, they have by test as much as three times the holding strength of anchors of similar appearance.



PAINE STEEL EXPANSION ANCHORS fasten anything securely in concrete, brick, tile, slate, marble and stone.

Having the largest gripping area of any expansion anchor, they hold firmly to the hole walls making them equally effective in bottomless or exact depth holes. May be used repeatedly with same security by bending jaws back to original position.

Write for Complete PAINE Catalog TODAY!

PAINE
1912 ANCHORS HANGERS 1939
Superior Features
BUILDERS SPECIALTIES

THE PAINE COMPANY

2961 Carroll Ave. Chicago, U.S.A.

Eastern Warehouse & Sales: 48 Warren St., N. Y.

In the News

[FROM PAGE 80]

G.E. Changes

General Electric Co., makes the following appointments:

G. R. Prout has been appointed manager of sales of industrial control. He has been acting manager of the southwestern district for the company's Industrial Department.

W. T. Darcey has been made manager of sales of renewal parts. He has been serving as assistant to W. C. Yates in charge of renewal parts sales.

R. T. Shiels, manager of the industrial department at Dallas, has been selected as the assistant to the district manager. H. A. White, manager of the El Paso office, succeeds Mr. Shiels at the Dallas office. E. C. Wise, of the general sales department at El Paso, has been named manager of that office.

•

The Photobell Corporation of New York has moved to new quarters at 123 Liberty Street, following a fire at its former plant location, 96 Warren Street.

•

The Wiremold Company of Hartford, Conn. has organized a Lighting Division with Perry S. Strang as manager. Mr. Strang, formerly of Chicago and more recently of Allentown, Pa., has been in the lighting industry for twenty-five years. He will be located in Hartford.

•

Westinghouse Electric & Manufacturing Co. has appointed Charles A. Dostal as manager of sales of the Pacific Coast District. He relieves Vice President William R. Marshall of managerial duties, so that he may devote his full time in this district.

•

Cutler-Hammer, Inc., announces the appointment of F. A. Wright as manager of Resale Sales, with headquarters in Milwaukee. Mr. Wright succeeds B. M. Horter, who was recently appointed General Sales Manager.

•

Airtemp Division, Chrysler Corporation, announces appointments of the following distributors: Bruno-New York, Inc., distributor of Airtemp's new Cool-Breeze units in New York and surrounding district; Lockie and Glenn, Cincinnati, to cover the Cincinnati district; Anchor Distributing Company, Pittsburgh, to cover western Pennsylvania, northern West Virginia, western Maryland and eastern Ohio; Mook Electric Supply Company, Canton, to cover Canton, Cleveland, Akron and Youngstown; Concord Hardware and Plumbing Supply Co., now covering New Hampshire to include Maine and Vermont; The W. C. Line Co., Inc., West Springfield, Mass., to cover Springfield.

HERWIG

OUT-DOOR
LIGHTING FIXTURES

Apartment Buildings
Public Buildings
Bungalows
Churches
Schools
Garages
Country Clubs
Warehouses
Residences

A FIXTURE FOR EVERY OUTDOOR PURPOSE

Send for our
CATALOGUE NO. 40
with NEW SUPPLEMENT
and REVISED PRICE LIST
200 Illustrations

The
Herwig Company
MANUFACTURERS
Established 1906
1753-59 Sedgwick Street
Chicago, Illinois, U. S. A.

Store Lighting that SELLS

When it comes to selling interior lighting for stores, STER-LITES are a powerful ally for contractors. Their extensive use in so many modern stores proves that!

The unique combination of intense, direct light for the merchandise with diffused eye-comforting general illumination is just what merchants need and want. Amazingly effective lighting with surprisingly low wattage makes an instant hit!

Sterling

Write for complete information on STER-LITE Louver-Controlled Direct Lighting Units—the key to Store Wiring Contracts.

STERLING REFLECTOR CO.
1435 West Hubbard Street, CHICAGO

YOU MAKE THREE PROFITS WHEN YOU SELL

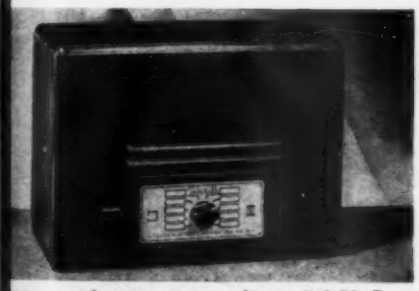
WEBSTER ELECTRIC **Teletalk**

REG. U.S. PAT. OFFICE

The Modern Method of Amplified Inter-communication

A PROFIT on the Sale of Teletalk . . .
a PROFIT on your Labor . . . and
a PROFIT on the Material

DEL 105: 5 station capacity. Lists at $39.50. Com-te system of this model, $197.50. From 1 to 5 aker-Microphones Model 5A-45 at $9.50 each be used with this model.



DEL 110: 10 station capacity. Lists at $49.50. Com-te system of this model, $495.00. Speaker-Mi-phone Model 5A-45 can also be used with this del.

DEL 212: 12 station capacity. Lists at $79.50. Com-te system of this model, $954.00. Speaker-Mi-phone Model 5A-45 can be used with this model any other model can be used in combination.

ANY electrical contractor who fails to get all the facts regarding the profit possibilities in the sale and installation of Teletalk is ignoring a good bet.

Teletalk is the new method of amplified inter-communication which offers much more than the generally accepted ideas of inter-communication.

While Teletalk offers two station inter-communication for as low as $49.00, yet the contractors who are now making money on Teletalk are those who are selling the larger installations. And some of these installations require many thousands of feet of wire, as well as conduit, junction boxes, and other material items. Then add to this the profit on the labor and you have a proposition worth pushing.

Furthermore, Teletalk opens up new avenues of sale for sound equipment—Webster Electric Sound Equipment in combination with Teletalk for systems where a broader type of service is desired.

Illustrated on this page are the principal models in the Teletalk line, together with prices which show the volume of sales involved in various types of systems. Write for selling helps and ask your local Graybar salesman how you can get some of this profitable business.

Licensed by Electrical Research Products, Inc. under U. S. Patents of American Telephone and Telegraph Company and Western Electric Company, Incorporated.

WEBSTER ELECTRIC COMPANY
Racine, Wisconsin, U. S. A. . . . . Established 1909
Export Dept.: 100 Varick Street, New York City
Cable Address: "ARLAB", New York

MODEL 212AM: 12 station capacity. Has annunciator feature. Lists at $102.50. System of 12 stations, $1230.00. This model requires Speaker-Microphone Model 5A-45B.

MODEL 224: 24 station capacity. Lists at $91.50. Complete system employing this model, $2196.00. Speaker-Microphone 5A-45 can be used with this model. All other models can be used in combination.

SPEAKER-MICROPHONE MODEL 5A-45: This is a Speaker unit only. It lists for $9.50. It can be used in combination with all other models and is especially designed for use at unimportant stations.

Webster Electric

"Where Quality is a Responsibility and Fair Dealing an Obligation"

UMI

★★★★★★★★★★

Badger

Synchronous
ELECTRIC
TIME
SWITCHES

• EASY TO INSTALL
• EASY TO SELL
• DEPENDABLE IN OPERATION

For A. C. loads up to 50 amperes. Furnished in single and double pole types and in either cast iron or sheet steel cases. $18.00 and up. Underwriters' Laboratories approved.

Insure your profits by installing Badger time switches on every possible job.

Both you and your customer will be thoroughly satisfied with the dependable, economical service these switches will give on every installation. Profits are yours—for keeps!

For further information on this and the other models of the Reliance line, see your wholesaler or write for bulletins.

RELIANCE AUTOMATIC LIGHTING COMPANY
1937 MEAD STREET
RACINE, WISCONSIN

More Gossip

Keeping Ahead

Russell Hawkins, of the Hawkins Electric Company of Springfield, Illinois believes in keeping his own store and offices as up-to-date in electrical equipment as the developments in lighting will permit. Although the existing equipment, a high intensity full indirect lighting system, is still new, it will soon be replaced by an ultra-modern installation of fluorescent lighting.

Station Fluorescents

With the two World's Fairs all ablaze with fluorescent outdoor applications, the E. J. White Company of Newark, N. J., sold the same idea in re-lighting a large gasoline service station with daylight fluorescent tubing. Yard floods, sign reflectors and ornamental brackets were all replaced with weatherproof tubing units. To avoid cold weather difficulties a small heater coil and thermostat at each group of tubes assures lamp operation on winter days.

HUDSON CONFERENCE — County licensing and adequate wiring are lively topics in Central Hudson (N. Y.) Valley towns these days. Edgar A. Popper (left) of Wappingers Falls and B. J. Van Wickler, electrical inspector for the New York Fire Insurance Rating Organization, have just finished a checkup on the progress made among contractors in that area. Mr. Popper is a member of the executive committee of the Hudson Valley Electric League.

Gadgets Sell

Speaking before a group of electrical contractors engaged in Chicago's rewiring campaign, Dr. Lynn Brown, Professor of Marketing, Northwestern University urged contractors to take along some tangible gadget or object that the customer can get his hands on to focus his attention during the sale.

This, he claims, is vital to getting action, without which no sale can be closed. Even a length of wire, or a switch may be enough to turn the trick.

Easy!

Neat!

Perfect Joints!

MARR CONNECTORS
SEND FOR FREE SAMPLE

Approved by Underwriters

THE RATTAN MANUFACTURING CO.
552 STATE STREET
NEW HAVEN, CONN., U. S. A.
GENERAL SALES AGENTS HATHEWAY AND CO.
220 CHURCH STREET, NEW YORK, N. Y., U. S. A.

BUYING HELP WANTED

No need for this sign when you have an

ELECTRICAL BUYERS REFERENCE

Containing complete information on electrical and allied products

Use your copy regularly to save time and money!

ELECTRICAL CONTRACTING
330 West 42nd Street, New York

INTRODUCING

NEW MAGNETIC STARTER FOR SMALL MOTORS

"Clamp-type terminals make connection a cinch"
"Oh-ho! Pure-silver in these contacts for long life"
"An E-shaped magnet with three sealing surfaces — that magnet will stand punishment"
"Yes, sir, Pole shaders are built right into the magnet"

For the first time, a full-voltage *magnetic* starter providing undervoltage protection, isothermic overload protection, facilities for remote operation, and all the other "magnetic" features is available at the low price of $14. It contains all the proved features of its bigger brothers, yet it is only a little larger than a manual starter. Write for complete information today.

Horsepower Ratings

Voltage	110	220	440/600
Single-phase	1	1½	
Three-phase	1½	2	2

GENERAL ELECTRIC

UMI

New G-E DEVICES FOR MODERN WIRING

1. TWIST-TITE OUTLETS

These outlets will please your customers. Plugs cannot be pulled out accidentally. Vibration will not loosen plugs or cause them to fall out. These outlets will accommodate any standard parallel-blade plug. A slight twist after plug is inserted keeps it tightly in place. Approved by Underwriters. Available in brown or ivory.

2. TAMRES PLUG FUSES

G-E Tamres tamper-resisting plug fuses will serve a dual purpose: as a standard plug fuse without the adapter or as a tamper-resisting plug fuse with the adapter. This double characteristic enables you to serve all customers from one stock. G-E Tamres fuses are available in 15, 20, 25 or 30 amp. capacity. Adapters for these fuses are available either with or without a locking spring. G-E Tamres plug fuses have standard medium Edison bases and will fit any standard fuse holder or cutout.

For further information about G-E Twist-Tite outlets or G-E Tamres Plug fuses see the nearest G-E Merchandise Distributor or write to Section D-949, Appliance and Merchandise Dept., General Electric Company, Bridgeport, Conn.

GENERAL ELECTRIC

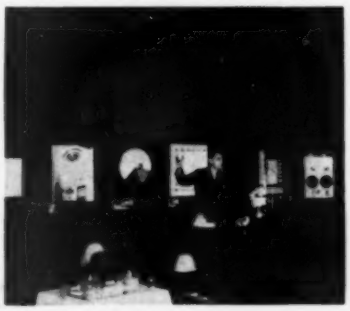
More Gossip

Stock that Pays

John J. Kennedy of Albany, N. Y., can fill orders for big temporary lighting jobs out of stock. He made it pay by getting high grade cast aluminum units that will take 1500-watt lamps and put a real punch into night lighting. When it's a quick job, this contractor can put on the show.

Bakery Motorization

Conveyorized bread baking ovens are big items in a modernization job now being wired in Cambridge by the A. J. Wolfe Co. of Boston. For one new 95-ft. oven there are eleven motors from ¼ to 6 hp. in size. It all adds up to a $15,000 wiring job.



LIGHT MIRACLES, a dramatic exposition of modern lighting technique and lighting methods was presented before Wisconsin Electrical Contractors in Milwaukee by A. A. Englehard of the Wisconsin Electric Power Company. The demonstration consisted of eight boxes illustrating various phases of light and wiring design prepared by I. L. Illing, popular engineer of the Wisconsin Electric Power Company of Milwaukee.

Impressive Returns

Ed Wigdahl, of the Wigdahl Electric Company of Chicago, tells us that a recent item in *Electrical Contracting* about the steel shelving in his service truck brought in a flow of correspondence from all over the country. Other contractors wanted to know where to get such equipment. Unfortunately, he says, the company who made the shelving illustrated is now out of business.

Slogan Clicks

In advertising for service and repair jobs, Henry M. Moses of the Henry M. Moses Electric Co. of Knoxville, Tenn., capitalizes neatly on his name for a slogan. Yes, you guessed it, the slogan is "Send for Moses When Your Lights Go Out."

SEE FOR YOURSELF

How wires are wedged fast—gripped *completely around* in the V-BOTTOM wire opening of

SOLDERLESS LUGS

Learn how fast you can make strong, neat solderless connections . . . with just your wrench, screw driver or pliers.

SEE ONE IN ACTION!

Write for Free sample—or better still, ask your Electrical Jobber for one.

DEPT. E C

Ilsco Copper Tube & Products, Inc.

5629 Madison Road, Cincinnati, Ohio

SAFE SIMPLE PROFITABLE RE-MO-LITE

- ***the only remote controlled lighting unit on the market***
- ***simplicity and speed of wiring give maximum profits***
- ***meets rural and industrial needs equally well***

Controlled from a single-wire service—any number of switches can be used—costs as little or less than old three-way service—comes complete with 2 switches, lag bolts, service screws, and instructions. Give your customers the very best in lighting efficiency with safety and economy. Install RE-MO-LITE. Ask about our free trial offer —get details.

Twentieth

CENTURY ENGINEERING CO.

MANKATO, MINNESOTA

A New Guide TO *EXTRA PROFITS*

NOW! A Complete Up-To-The-Minute Catalog To Help You Sell Private Telephone Systems and Accessories

This catalog was produced to meet your requirements for a convenient handbook embracing our full line of telephone systems.

And, of particular significance to you—

It was produced to satisfy the insistent demand from business organizations for more information on modern intercommunicating equipment!

That means a broad market, pre-sold on the value of intercommunicating facilities, is ready to buy! It means new opportunity *for you!*

If you have not yet received your copy of the catalog write us at once. Use it to show your customers and prospects the variety of telephone systems and time-saving accessories available to them. If you need help on specific jobs a telephone call will bring our local representative promptly.

Automatic Electric Intercommunicating Systems are designed for private service. They cannot be connected with the public telephone system.

AUTOMATIC ELECTRIC

PRIVATE INTERIOR TELEPHONE SYSTEMS

Distributed by: AMERICAN AUTOMATIC ELECTRIC SALES COMPANY, 1033 West Van Buren Street, Chicago, Illinois

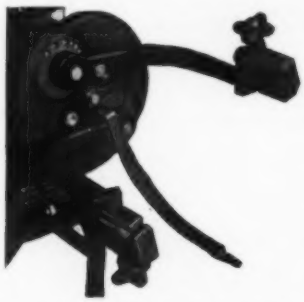
Sales and Service Offices in Principal Cities • In Canada: Canadian Telephones & Supplies, Limited, Toronto

UMI

EQUIPMENT News

Armature Winding Yoke

An armature winding yoke to wind any type of armature with a shaft from 9 to 19 inches in length. Wires are guided into slot by hand. Two cast iron arms are fastened to round mounting base and may be adjusted either to increase or decrease the span of the yoke, by swinging them toward or away from center of discs. Steel jaws for clamping armature are mounted on outmost end of each arm. The third or small auxiliary arm is used to form loop after winding each coil. It is made with a base for mounting on face plate of lathe or turning device. Ideal Commutator Dresser Co., 1041 Park Ave., Sycamore, Ill.



IDEAL ARMATURE WINDING YOKE

■

Electrical Terminal

This terminal connector is designed to accommodate a range of wire or cable sizes. One-piece assembly. Pressure strip prevents clamping screw from damaging conductor. Entire connector is tinned to prevent corrosion and discoloration. Made for all conductor sizes from No. 14 to 4/0 and approved by Underwriters. Burndy Engineering Co., Inc., 459 E. 133d St., New York.

BURNDY CONNECTOR

WESTINGHOUSE FLOODLIGHT

Floodlight Unit

A new floodlight for use in sports areas, service stations, construction projects, industrial yards. It can use 750-, 1,000- or 1,500-watt lamps. An optional cover glass is swivelled at top of reflector. Three stainless-steel clamps hold cover in place. Cast-aluminum hood insures weather-tight joining. Wide range of beam spreads is possible through choice of polished, narrow-beam reflector or diffusing, wide-beam reflector; plain or diffuse lens; and clear or inside frosted lamps. Construction of reflector base and bracket permits wiring without handling reflector. Westinghouse Electric & Mfg. Co., Cleveland, Ohio.

■

ARROW-HART & HEGEMAN SOCKET

Extension Socket

This one-piece extension socket, No. 294, provides support for reflector and lamp outlet for revised lighting unit. Porcelain supporting ring is adjustable to permit proper centering of lamp in shade or reflector. Extension socket accommodates medium base lamps. Arrow-Hart & Hegeman Electric Co., Hartford, Conn.

BLACKHAWK PIPE BENDER

Pipe Bender

A new "Porto-Power" pipe bender, Model S-36, has a simplified one-piece bending frame, which eliminates 13 various extension bars, tension arms, studs and other parts used before. A 20-ton hydraulic unit, the bender handles seven sizes of rigid conduit and pipe, including 1¼, 1½, 2, 2½, 3, 3½ and 4 inch diameters.

The new "Pull Pin" method of fastening the rotating pivot shoes without wrenches, saves time. The ram can be detached quickly from the bending frame and used with special attachments for pulling pulleys, lifting machinery, or as a 20-ton jack.

Bending shoes are furnished for seven sizes of pipe. Unit operates horizontally, vertically or at any angle. Pivot shoes have wide rims which serve as wheels for rolling unit along floor. Blackhawk Mfg. Co., Milwaukee, Wis.

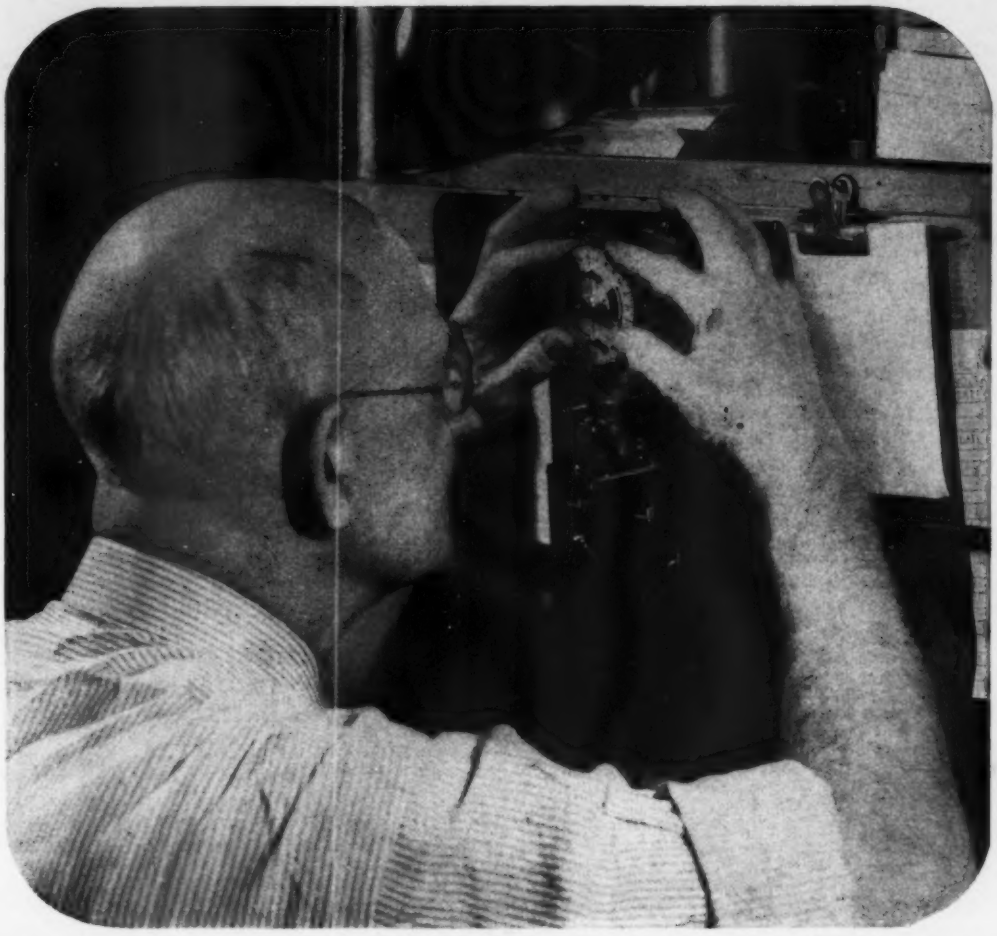
■

G.E. PRESSURE SWITCH

Pressure Switch

A new single-pole pressure switch (CR2927-A100) designed for use with water pumps whose motors are provided with overload protection. It has a built-in phosphor-bronze diaphragm, simple lever system and Alnico magnet contact mechanism. Device is enclosed in aluminum-finished steel drip-proof case and all parts are corrosion-resistant for operation in damp places. It is set to operate at 20-pound cut-in and 40-pound cut-out, but its pressure range can be carried by a thumbnut from 10-pound cut-in and 30-pound cut-out to 60-pound cut-in and 80-pound cut-out. Has a rating of ½ hp, 110 volts a.c.; 1 h.p., 220 volts a.c.; 45 amperes maximum starting current. General Electric Co., Schenectady, N. Y.

"undivided profits" are yours



WHEN YOU INSTALL A SANGAMO TIME-SWITCH

After the motor, the contacts, and other vital parts of Sangamo Time-Switches have been thoroughly tested and checked, every switch must pass the scrutiny of a master craftsman who makes the finishing adjustments, then gives the switch his final okey. This intense inspection routine, together with the correct basic design of all Sangamo Time-Switches, makes sure that "undivided profits"—not annoying service calls—are yours when you install a Sangamo Time-Switch.

Your customers will prefer this modern, popular-priced Form KAZ Astronomic Dial Time-Switch.

SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS

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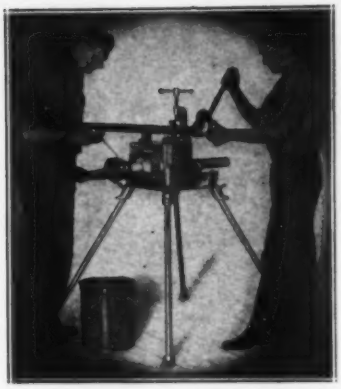


Beaver Model-C
Converts Hand Tools into Electric Tools
1/8 to 8 inches

For bench or stand use. Will thread 2-inch pipe with solid full-width dies—up to 8-inch pipe with geared tools and drive shaft. Ample reserve power to allow for dull dies or low line voltage. Gears fully enclosed (a safety feature) and run in oil (reducing noise, wear and friction).

Complete, for bench use	$127.50
Set of four legs with feet and spikes	5.50
Pipe Vise, 1/8 to 2", mounted	3.50
Pipe Bender, 1/8 to 3/4", mounted	1.50

Read What Users Say!

Speeds Up Conduit Installation

"If we removed Model-C from the job the progress of the job would be slowed up at least 25%. We even cut and thread conduit in it after it has been bent.

"We can recommend the Beaver Model-C Power Unit to any contractor."

Robert J. Nickles
Electrical Contractor
Madison, Wisconsin

Two On One Job

"We like our Beaver Model-C Power Unit so well that we have two of them on one job here in Kansas City. They more than pay for themselves."

Evans Elec. Const. Co.
Kansas City, Mo.

Also to Pull Feeder Wires

"We have used our Model-C for threading bolts and conduit from 1/2 to 5". We also used it with a winch and wire rope to pull all the feeder wires on the Agar Box Manufacturing Company's new five-acre plant in this city.

"We are delighted with Model-C and recommend it highly."

W. T. Foley Electric Company
Kansas City, Kansas

Saves "Back-breaking" Work!

"We have used our Model-C Power Unit for threading conduit from 1/2 to 6". We like it because it 'saves back-breaking work', and because it can easily be carried to different locations. We have also used our Unit and Drive Shaft to turn a cable puller for drawing large wires or lead cable in conduits or ducts.

"How any electrical contractor can afford to be without one of these Units is a mystery to me, and I can heartily recommend it".

Newton Electric Company
Muncie, Indiana

Write for Bulletin C

BEAVER PIPE TOOLS, INC.
939 Deen Ave., Warren, Ohio

EQUIPMENT NEWS

[FROM PAGE 88]

Voltage Controller

A new variable voltage transformer for use in controlling theater and display lights, electric baking oven temperatures and some induction motors. Also used to provide proper line voltage for electrical equipment and a variable voltage source for electrical testing. Available in single and three-phase units from 2 to 25 kva. for operation on 115, 230 and 440 volts. Output voltages vary from zero to above line values. Features are smooth action, low weight, high efficiency and either table or panel mounting. Superior Electric Co., 53 Harrison St., Bristol, Conn.

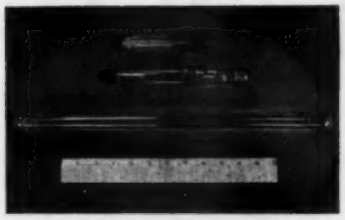
SUPERIOR VOLTAGE TRANSFORMER

■

KILLARK WEATHERPROOF SWITCH

Weatherproof Switch

This new FSWPE weatherproof outdoor toggle switch is designed for outdoor wiring and electric signs. Has a cast malleable fitting with cast cover and a switch arm for propelling any form of toggle switch. Recommended for farm and R.E.A. wiring as switch may be turned on or off with hand or elbow during coldest or most disagreeable weather. Fitting is supplied with one or two hubs in any desired position. Killark Electric Manufacturing Co., Vandeventer and Easton Aves., St. Louis, Mo.



G-E GERMICIDAL TUBES

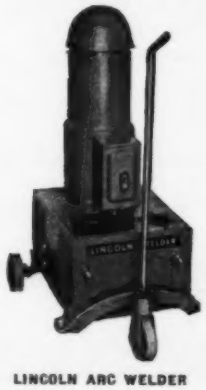
Germicidal Lamps

Three new ultraviolet-emitting tubes designed for sterilizing needs. Available in 3, 5 and 15-watt sizes. Equipped with special glass bulbs, the sterilizing tubes emit ultraviolet effective in destroying bacteria. Each tube requires an auxiliary or "choke". The 3 and 15-watt tubes need special sockets. The 5-watt tube fits ordinary sockets. The 3-watt tube is 5⅜ inches long; the 5-watt is 7⅛ inches and the 15-watt measures 18 inches. Suitable for installation in places where space is limited as in cabinets and cupboard areas. Used by doctors, dentists and hospital staffs. General Electric Co., Nela Park, Cleveland, Ohio.

■

Arc Welder

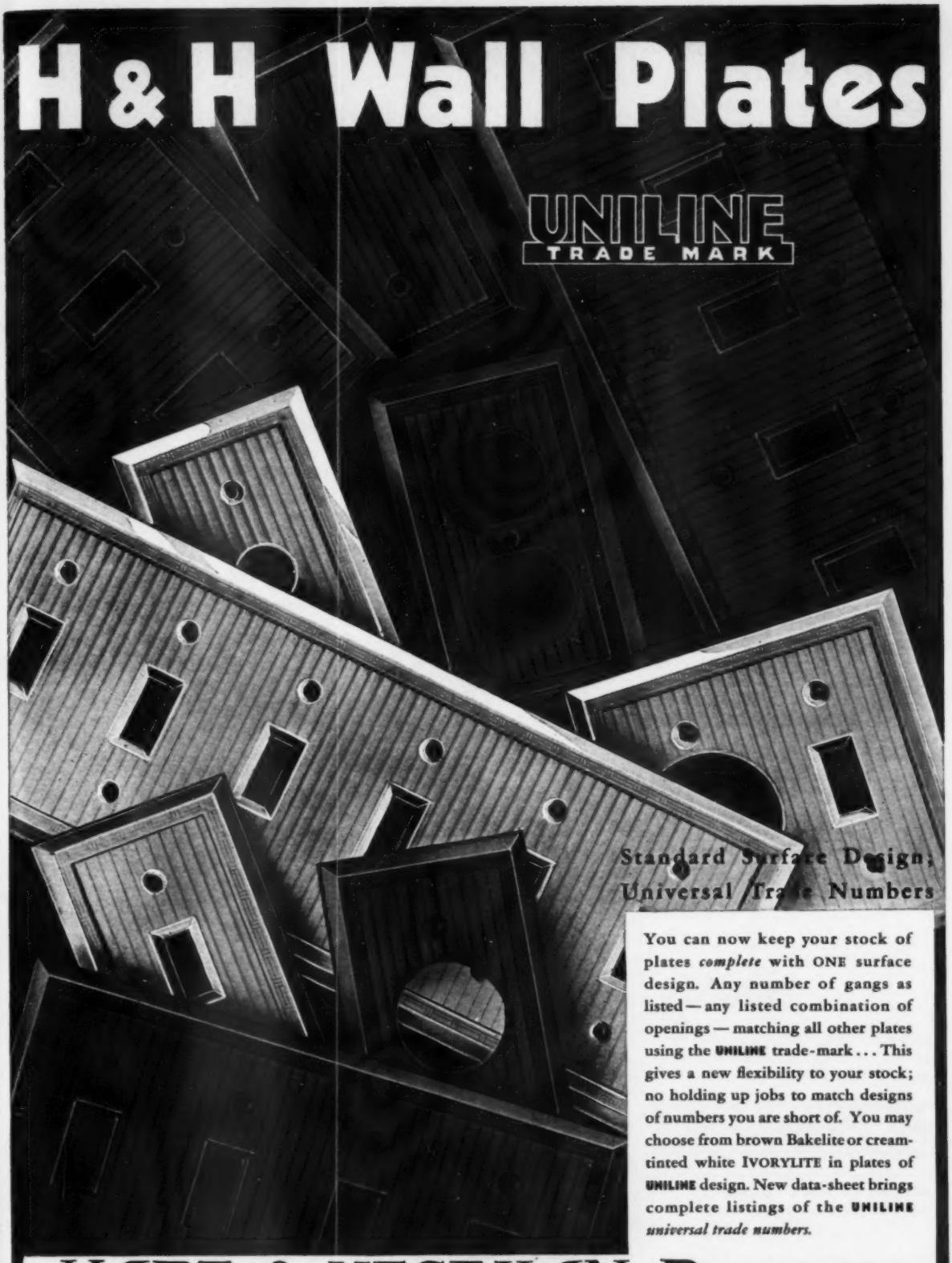
This small motor-generator type arc welder claims greater convenience and accuracy in welding because of a new self-indicating dual continuous current control. It is expected to widen application of welding in new fields such as garages, bus and truck fleet repair shops, sheet metal shops, maintenance departments. Listed as "SA-150", it has both job selector and current control calibrated and equipped with dials which indicate type of work and number of amperes for each and every setting. Both voltage control and current control are continuous in operation. At lower part of range, welder delivers a current of light-penetration for welding light-gauge material. At upper portion it delivers ample current for speedy welding of heavier materials. Connections are accessible for either 220 or 440 volts, 3 or 2-phase, 60 or 50 cycles as desired. Also can be supplied for 550 volts or special voltages. The Lincoln Electric Company, 12818 Coit Road, Cleveland, Ohio.



LINCOLN ARC WELDER

H & H Wall Plates

UNILINE
TRADE MARK



Standard Surface Design;
Universal Trade Numbers

You can now keep your stock of plates *complete* with ONE surface design. Any number of gangs as listed — any listed combination of openings — matching all other plates using the UNILINE trade-mark . . . This gives a new flexibility to your stock; no holding up jobs to match designs of numbers you are short of. You may choose from brown Bakelite or cream-tinted white IVORYLITE in plates of UNILINE design. New data-sheet brings complete listings of the UNILINE *universal trade numbers.*

HART & HEGEMAN DIVISION
THE ARROW-HART & HEGEMAN ELECTRIC CO. HARTFORD, CONN.

UMI

MAKE MONEY

For YOURSELF by

SAVING MONEY FOR YOUR CUSTOMERS

TIME WASTED IS MONEY LOST

A MODERN CALL SYSTEM WILL SAVE IT

Show your customers how a Federal Signakall system will save money for their organizations. Their customers won't have to "cool their heels" in the reception room or "hold the wire" while a search is made for an executive, foreman, or other key employee. Routine will be speeded, and time wasting delays eliminated.

The NEW FEDERAL RESONATING HORN will provide a distinctive signal in locations where noise levels are hard to overcome. Ask for literature on Federal horns and sirens for every application.

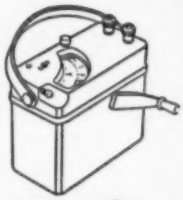
#55-AC #56-DC

Ask for Catalog Pages 107-12

FEDERAL ELECTRIC CO., INC.

8726 South State St. Chicago, Ill.

. . If you want to sell adequate wiring be sure that you supply adequate insulation.



Test all insulation with an OK MEGOHMER.

Megohmers are not expensive. Get our prices on the various models, including the famous Model D.M.

MAIL THIS COUPON TO-DAY FOR COPY OF STICHT'S LATEST BULLETIN.

HERMAN H. STICHT & CO.
Dept. 53, 27 Park Place, New York

Send Bulletin 405/173 and prices.

Name.....

Firm.....

Address.....

9319

EQUIPMENT NEWS

[FROM PAGE 90]

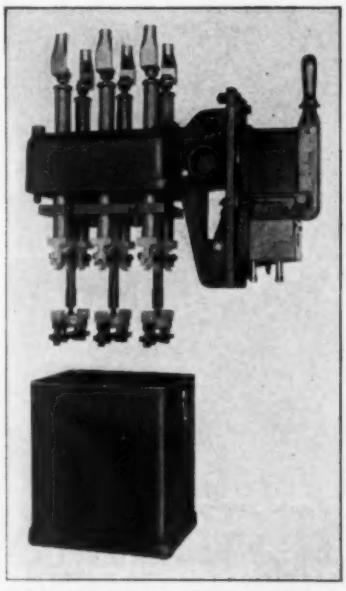
Glass Insulated Cable

A new type neon sign cable features a braid of Fiberglas, pure glass fibers. Braid is non-hygroscopic and does not char with age. Advantages listed are small size, great flexibility, long service life and ease of installation. Belden Manufacturing Co., 4689 W. Van Buren St., Chicago, Ill.

BELDEN FIBERGLAS INSULATED CABLE

Switchboard Oil Circuit Breaker

Known as type KD-20, this new switchboard type oil circuit breaker has wide application in industrial service. It has three poles arranged one behind the other. The arrangement of bushings eliminates crossing leads in certain applications of open and enclosed switchboards. Also adaptable for replacing obsolete breakers of same arrangement, as existing bus and feeder connections may be retained. Equipped with large butt type arcing contacts. Furnished for 600 amperes at 15 kv., 1,200 amperes at 7.5 kv. and 2,000 amperes at 5 kv. Arranged for flat surface mounting or for mounting in cells, switchhouses, cubicles, metal clad switching equipment and safety enclosed switchboards. Allis-Chalmers Mfg. Co., Milwaukee, Wis.



ALLIS-CHALMERS OIL CIRCUIT BREAKER

•CAPACITORS•

Fitted to Your Motor

Makes no difference whether that capacitor-type motor calls for an electrolytic or an oil-filled capacitor. AEROVOX makes either kind.

●

And to make certain that you'll get the correct type, AEROVOX issues up-to-the-minute wall charts and catalogs listing ALL standard motors and their replacement needs. Meanwhile, live-wire refrigerator-parts jobbers stock AEROVOX replacements.

●

• *Get the* DATA . .

Your refrigerator-parts jobber has a copy of our latest catalog awaiting you. Also a stock of replacements. Ask him about these capacitors—or write us direct.

AEROVOX

NEW BEDFORD, MASS.

SIGNAL TIMERS

For STARTING AND STOPPING INDUSTRIAL WORK

For MARKING SCHOOL CLASS PERIODS

For SOUNDING MUNICIPAL TIME SIGNALS, ETC.

Furnished with from one to six permanently set signal periods, for any times desired, but more than five minutes apart. Additional signal periods at little added cost. The schedule can be changed at the factory any time a different program is wanted.

$30.00 With addition of *both* a "Manual Control" and "Sunday and Holiday Cutout", $35.00.

AUTOMATIC ELECTRIC MFG. CO.

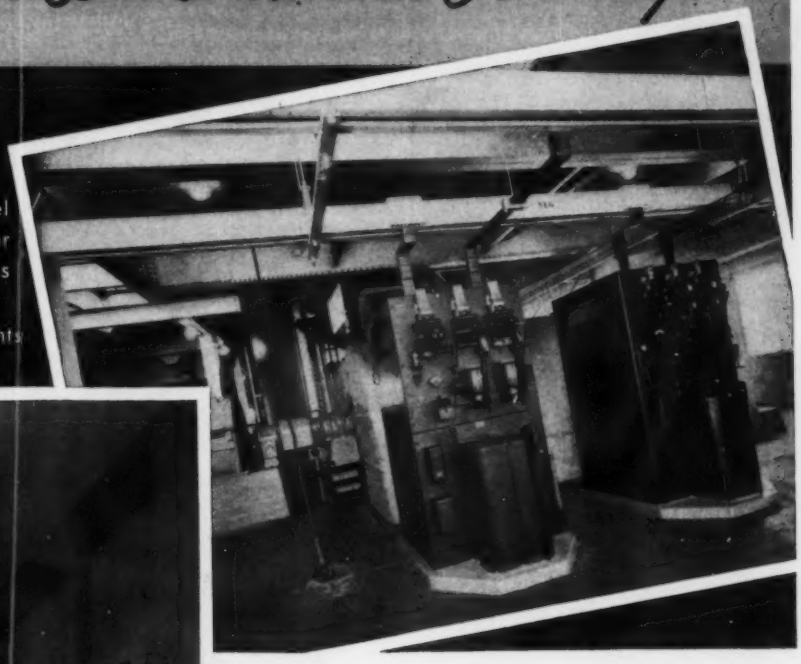
MANKATO, MINN.

WHAT A COMBINATION OF DESIRABLE PROPERTIES!

Aluminum Bus Bars and Housings

ALCOA

Alcoa Aluminum Channel Bus Bars Supply Power to Station Auxiliaries



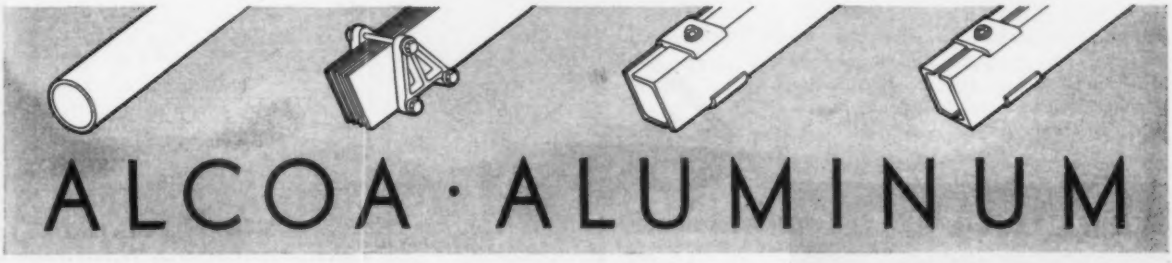
These Aluminum Compartments House 24,000-volt Buses

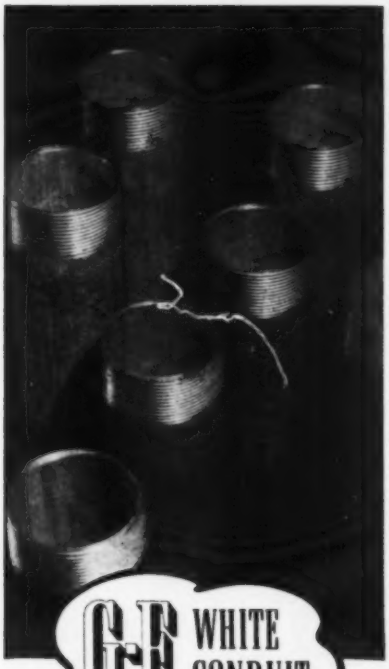
Ask our engineers for assistance on your bus bar and enclosure problems. ALUMINUM COMPANY OF AMERICA, 2197 Gulf Bldg., Pittsburgh, Pa.

The Detroit Edison Company employs Aluminum enclosures for the high current buses and switching apparatus at Essex Switching Station and the Conners Creek plant. Because it is non-magnetic, Aluminum avoids the heating effect of magnetic materials under similar conditions. Equipment housed in Aluminum carries heavier loads without overheating.

Some bus bars at these stations are likewise Alcoa Aluminum. They provide high electrical conductivity, are light in weight and highly resistant to corrosion.

Aluminum housings and bus bars are easily fabricated from standard structural materials, purchased from stock. Aluminum construction is strong and neat, and needs no protective coating of paint. Its lighter weight places less burden on supporting structures, thereby simplifying construction and reducing costs.





G-E WHITE CONDUIT

GIVES LASTING PROTECTION

G-E White Rigid Conduit gives permanent protection for electrical wiring systems. It is made of "rimmed" steel, hot-dipped-galvanized and Glyptal-coated inside and out. It is easy to bend and install. It has clean accurate threads. There is a complete line of boxes and fittings available.

OTHER G-E CONDUIT PRODUCTS

For wiring where rigid conduit is not specified or required, General Electric offers the following materials:

Flexible Metal Conduit
Electrical Metallic Tubing
"Fiberduct" Underfloor Raceways
Service Entrance Cable
"BX" Armored Cable
"BraidX" Non-metallic Sheathed Cable

Exactly the right boxes and fittings are available for use with all types of G-E raceways and cables as well as with G-E White Rigid Conduit.

ADDITIONAL INFORMATION

For further information about G-E White Conduit or other G-E Conduit Products, see the nearest G-E Merchandise Distributor or write to Section C-949, Appliance and Merchandise Department, General Electric Company, Bridgeport, Connecticut.

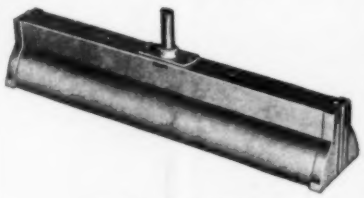
GENERAL ELECTRIC

EQUIPMENT NEWS

[FROM PAGE 93]

Fluorescent Lamp Fixture

This new fluorescent lamp fixture has been developed for use in places where soft daylight illumination is desirable. Recommended for matching of color, inspecting of metallic parts of varying degrees of brightness and service in printing establishments. It is a basic unit with different types of fittings. Steel wiring trough is finished in aluminum bronze and provides housing for auxiliaries and receptacles and carries supporting fitting. Wiring trough is removed by loosening holding screw at either end and slipping out reflector with end pieces. Switch knockouts are provided. An interchangeable "end section" may be used to join units together to make a line fixture. Multi Electrical Manufacturing Co., 1840 West 14th St., Chicago, Ill.



MULTI LAMP FIXTURE

Floodlight

A 250-watt enclosed portable floodlight for temporary or emergency illumination. Light is equipped with a galvanized steel trunnion bracket with a 12-inch circular base, 10 feet of rubber-jacketed cord with plug and carrying handle. Alzak-processed aluminum reflector is inserted in cast aluminum housing with glass door available in plain, lightly stippled, heavily stippled and spreadlight types. General Electric Co., Schenectady, N. Y.

G.E. PORTABLE FLOODLIGHT

NOW- how to repair and rewind all types of motors . . .

ELECTRIC MOTOR REPAIR LIBRARY

4 volumes, $10.00, payable in easy monthly installments

THIS set of books should be on the shelf of every man who ever has to touch a motor for purposes of repairing it or changing it to meet different operating conditions. In shop language and with practical shop methods it covers every step in stripping, rewinding and connecting a.c. and d.c. motors of all kinds.

Do you know how to:

—lay out a wave winding
—test a.c. and d.c. motors to locate grounds, shorts, opens, quickly and positively
—properly record data when stripping armatures so that it will be instantly usable for correct rewinding by yourself or any experienced winder at any time afterward
—determine how many coils can safely be cut out
—lay out single-phase fan motor windings
—change single-phase windings for two- or three-phase operation
—make cross or equalizer connections on lap windings
—lay out frog-leg windings
—handle every step in a rewinding job from the time it comes into the shop until it leaves
—wind stators for tubogenerators
—band high-speed armatures
—rewind motors for voltage, speed, frequency, or cycle changes
—etc., etc., etc.

1,079 pages of practical shop methods and data on jobs like these in this library. A complete, modern key to repair of all motors. Nothing else in it; every page filled with definite, practical facts for the industrial maintenance man and the electric shop worker.

How to change motors for different operating conditions

Here is all the information you need in order to determine what changes various types of motors permit; to lay out new windings for specified service conditions; and to handle every step in the work with satisfactory results.

Covers all types of motors, from those used in small household and commercial appliances of all kinds, to mining and railway motors. Explains principles underlying the different types of winding; gives definite instructions for doing the various rewinding jobs. Also gives many data, tables and diagrams constantly needed by the repair man, including data difficult to get from any other sources.

Low price—easy terms—10 days' examination on approval

Bought separately the books in this Library would cost you $11. By using this coupon you need pay only $2.00 in 10 days and $2.00 monthly until the special price of $10.00 is paid. In addition, we give you 10 days in which to examine the books. Send no money; simply fill in and mail the coupon now; let us know your answer after you have seen the books.

McGraw-Hill Book Co., Inc.
330 W. 42nd St., N. Y. C.

Send Electric Motor Repair Library for 10 days' examination on approval. In 10 days I will send $2.00, plus few cents postage, and $2.00 monthly for four months, or return books postpaid. (We pay postage on orders accompanied by remittance of first installment.)

Name .....
Address .....
City and State .....
Position .....
Company ..... E.C. 9-39
(Books sent on approval in U.S. and Canada only.)

Speed Indicator

A new electric remote speed indicator for the U. S. Varidrive motor. It provides an accurate and simple means of selecting the operating speed of motor from a remote point. Consists of a meter as an indicator mounted in box with push button for controlling electric pilot motor that changes speed. It is calibrated in divisions 1 to 10, but scales are obtainable, calibrated to suit customer's requirements. Remote indicator stations, may be replaced by single push button station or by automatic control equipment, such as cyclic relays, thermostats, pressure or cam mechanisms. U. S. Electrical Motors, Inc., 200 East Slauson Ave., Los Angeles, Calif.

U. S. REMOTE SPEED INDICATOR

Sign Fittings

New SF sign fittings have been designed for use in connection with gasoline and service station signs. Cross arm on which sign is hung serves as conduit for wires leading to fitting. A hole is drilled in top of cross arm to take small centering hub in bottom of fitting. Conduit is run from fitting to light reflectors and splicing of wires is completed inside SF fitting which has a removable cover. Killark Electric Mfg. Co., Vandeventer and Easton Aves., St. Louis, Mo.

KILLARK SIGN FITTING

Solder Pot

A small rectangular electric solder pot designed for solder dipping of small and delicate parts. Has a 2½ oz. solder capacity. It is heated by a 75 watt replaceable cartridge unit. Six foot cord and attachment plug is provided. Cord is protected from spilled solder where it leaves the pot by a metal tube. Pot is cast iron with sheet metal legs and mounting holes. Vulcan Electric Co., Lynn, Mass.

VULCAN ELECTRIC SOLDER POT

ENGINEERED ILLUMINATION FOR THE HOME . . .

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ART METAL *Fixtures*

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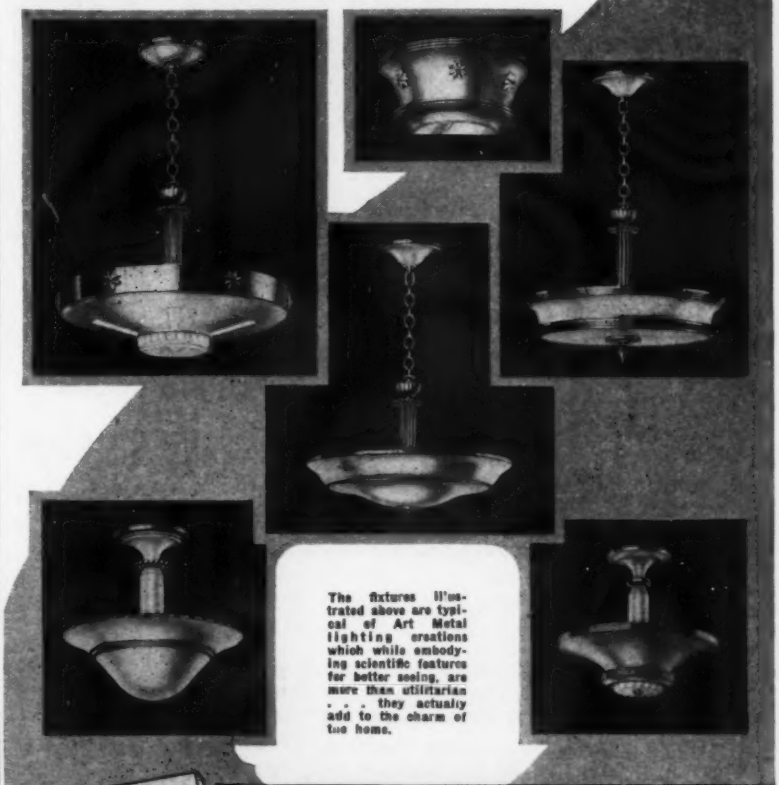
For home lighting conditions, "There must be enough light and it must come from the right direction." Light for *seeing* . . . and the easiest way to get it is with Art Metal Engineered lighting fixtures! Embodying the essentials for good light conditioning, they also provide that touch of decoration and finesse to keynote the artistic temperament of any interior.

Art Metal Fixtures are laboratory tested to provide the *correct* light for every type of home service . . . they bring out the beauty and color of the room and are styled to complement any decorative scheme. Our new booklet, *"Fashions in Lighting"*, describes in detail the "whys" and "wherefores" of engineered illumination and how it can make a house a *home*. Send for free copy today.



The fixtures illustrated above are typical of Art Metal lighting creations which while embodying scientific features for better seeing, are more than utilitarian . . . they actually add to the charm of the home.

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THE ART METAL COMPANY, Cleveland, Ohio

Please send me free copy of Booklet R-240.

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Company.....

Street.....

City..... State.....

We were working on the rewiring estimate for the change-over in production at the D & S plant. It had to be in the manager's hands by 4 P. M. Monday, which meant that Bill and I were stuck for the weekend.

Sunday afternoon we got to the point where we needed to compare different makes of metal moldings, and select the one that would enable us to run through ten No. 12 single conductors. We hunted high and low—no manufacturers' catalogs in the files could help us.

"We're sunk", said Bill, "No time now to even wire for the dope."

Then I remembered the blue-and-orange Electrical Buyers Reference. It was the work of a few moments to compare the catalog data of several leading molding manufacturers, and find all the information we needed. By noon Monday our bid was in, complete in every detail.

"WE'RE SUNK—that estimate has to be in Monday!"

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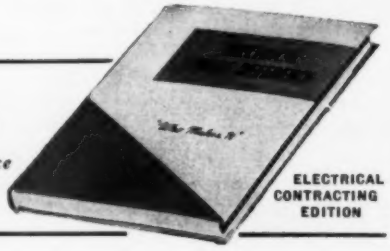


ELECTRICAL CONTRACTING EDITION

EQUIPMENT NEWS

[FROM PAGE 94]

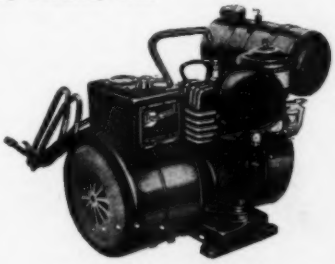
Signalling Transformer

A new line of heavy duty type signalling transformers designed for applications that require unvarying operating characteristics under continuous performance. Recommended for the conversion of 115 volt primary to 4, 8, 12, 16, 20 or 24 volt low voltage supply for operation of bells, gongs, horns, sirens, signalling systems, annunciators, relays, control systems. Cores and coils are sealed in compound that is unaffected by high room temperatures, moisture or cold. Black enameled, rust resisting case, includes outlet box compartments for primary and secondary connection. Knockouts provide for conduit or armored cable. Available in 50, 100, 250, 500, 750 VA capacity. Acme Electric & Mfg. Co., Cleveland, Ohio.

ACME SIGNALLING TRANSFORMER

Portable Electric Plants

Two small portable electric plants, the GH series, have been added to the Universal line. Designed for charging storage and radio batteries and lighting for farms, cottages, camps, boats, trailers, floodlights as well as commercial uses. One is 6 volt 250 watt, the other a 12 volt 300 watt plant. Driven by a single cylinder, 4 cycle, air cooled gasoline engine, direct connected to large generator. Plant comes complete and ready to run. Has a multiple control switch with start, stop, high and low charging rates. Universal Motor Co., Oshkosh, Wis.



UNIVERSAL PORTABLE PLANT

Lamp Guards

The new "Loxon" and "Gripon" lamp guards of heavily tinned steel wire have been redesigned to fit the new mazda lamps. They are now made to fit either brass shell or weatherproof sockets and regular or mill type lamps. The Loxon style employs the key locking device, while the Gripon uses plain steel screws. McGill Manufacturing Co., Valparaiso, Indiana.

McGILL LAMP GUARDS

■

Service Entrance Cable Fitting

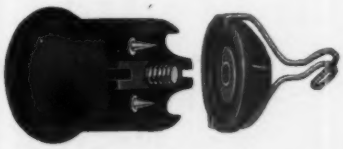
New improved service entrance cable fittings. Small size for No. 8-3 and No. 8-2. Larger size for No. 6 and No. 4 cable. Equipped with heavy non-cutting tongue for supporting cable with extra long mounting strap for attaching with lag screws and wrench. Entirely weatherproof. Killark Electric Mfg. Co., Vandeventer and Easton Aves., St. Louis, Mo.

KILLARK ENTRANCE CABLE FITTING

■

Pin Type Lampholders

An intermediate base pin type lampholder made of bakelite, for streamer and decorative work. Features detachable hook for hanging, and sharp pointed terminal screws which pierce the wire insulation without injury when the cap is screwed on. Eliminates stripping, soldering and taping. Both wire and lampholders may be reused many times. The Bryant Electric Co., Bridgeport, Conn.



BRYANT PIN TYPE LAMPHOLDER

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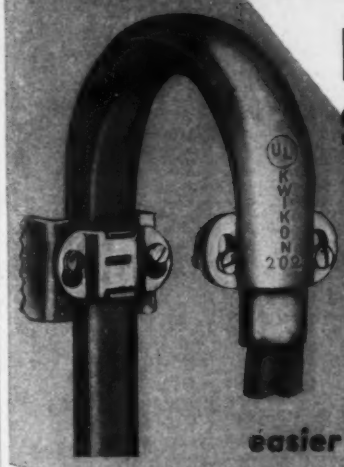

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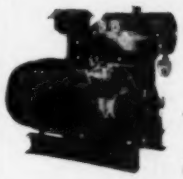

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Announces

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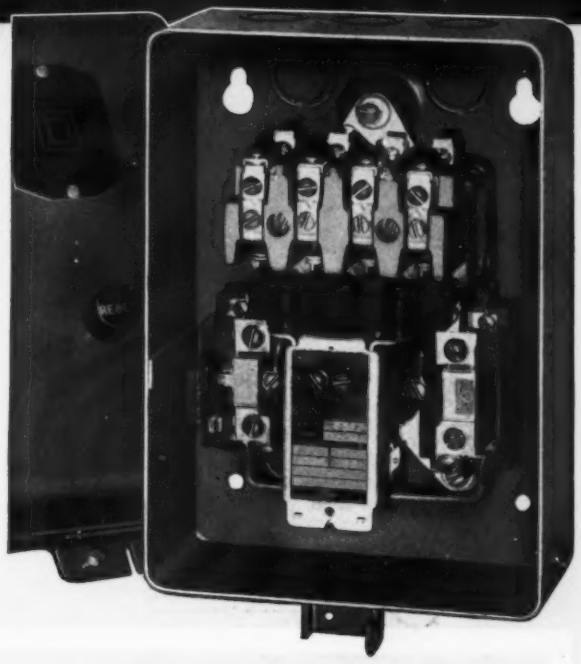
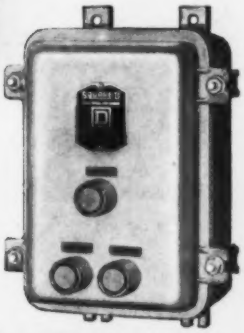


● The new Size O, Type R, is a smaller vertically operating starter in the Class 8536 line. It meets the demand for an automatic starter for the smaller sizes of polyphase and single phase motors. Maximum polyphase ratings are 2 H.P., 220, 440, 550 Volts; maximum single phase ratings are 1 H.P., 110 Volts or 1½ H.P., 220 Volts.

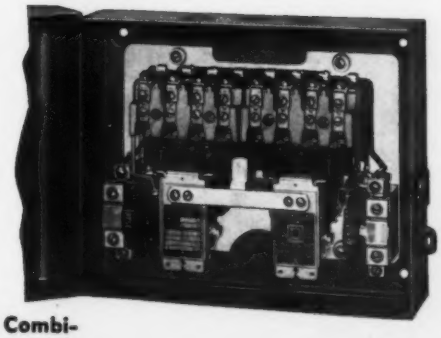
This starter has a vertically operating magnet, double break silver contacts and thermal overload relays. It is offered with general purpose, dust-tight, water-tight or Class II, Group G enclosures; also as a combination starter with either disconnect switch or circuit breaker; also in the reversing type.

(*Extreme Left*) Start-Stop push buttons in cover

(*Left*) Three-Way selector switch in cover



(*Above*) Water-tight, dust-tight or Class II, Group G enclosure



(*Left*) Reversing automatic starter

(*Left*) Combination with disconnect switch

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